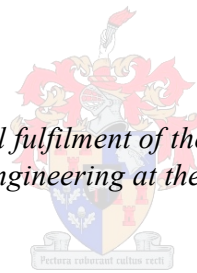


A pragmatic approach to knowledge management: Understanding the dynamics of knowledge sharing

by
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Declaration

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Summary

Can one measure the value of knowledge sharing? How does one assess the effectiveness of a knowledge network with regard to supporting knowledge sharing? These are pertinent questions that knowledge managers are faced with, because geographically dispersed organizations rely on knowledge networks to integrate its dispersed knowledge.

These questions must be understood in the context of a knowledge management approach, for the approach determines how one navigates the complex landscape of knowledge sharing. This complexity is driven by the social dynamics that exist between organizational members. If the intricacies of these social dynamics can be highlighted, it will assist management in deciding which interventions to implement to increase a knowledge network's effectiveness.

Firstly, a pragmatic approach to knowledge management proposes that management can switch between a bottom-up and top-down view of knowledge sharing in a knowledge network.

Secondly, management requires a vehicle to implement the pragmatic approach. The proposed vehicle is the knowledge network framework, for it plays a central role in the design, implementation and maintenance of a knowledge network.

Finally, the embeddedness-measuring framework is developed to analyze the social dynamics between knowledge network members and the content they share amongst one another. The implementation of this framework allows for the analysis of interviews that were conducted in a case study at A Chemicals Company (ACC). Five communities of ACC's knowledge network are investigated and the results emphasize the dynamics of knowledge sharing between network members.

The implications of the results are as follows:

- A navigation system is proposed that enables the implementation of the pragmatic approach.
- A schedule for the evaluation of a knowledge network enables management to assess the effects of interventions.

Opsomming

Kan die waarde van die proses om kennis te deel, gemeet word? Hoe word 'n kennis-netwerk se doeltreffendheid gemeet met betrekking tot die ondersteuning wat dit bied vir netwerk-lede om hul kennis te deel? Dit is die tipe vrae wat kennis-bestuurders mee gekonfronteer word, want organisasies wat geografies versprei is maak staat op kennis-netwerke om verspreide kennis te integreer.

Om hierdie vrae te verstaan, moet dit gesien word in die konteks van 'n kennisbestuur-strategie. Die kennisbestuur-strategie bepaal hoe 'n mens die kompleksiteit van kennis-skepping en -uitruiling benader. 'n Groot faktor wat dié kompleksiteit beïnvloed, is die sosiale dinamika tussen netwerk-lede. Daar word dus geredeneer, dat as sin gemaak kan word van dié dinamika, bestuur se vermoë om in te gryp in die kennis-netwerk verbeter sal word. Gevolglik kan die doeltreffendheid van 'n kennis-netwerk verbeter word.

Eerstens word die pragmatiese benadering tot kennisbestuur voorgestel. Dié strategie gee bestuur die vermoë om te wissel tussen 'n *top-down* benadering en 'n *bottom-up* benadering tot kennisbestuur.

Tweedens word die kennis-netwerk raamwerk bespreek. Hierdie raamwerk beskryf die ontwerp, implimentering en instandhouding van 'n kennis-netwerk. Dit bied bestuur die vermoë om die pragmatiese benadering te volg.

Ten slotte word die geïntegreerde metings raamwerk ontwikkel. Hierdie raamwerk stel mens instaat om 'n analise te doen van die sosiale dinamika tussen netwerk-lede en die inhoud wat hulle met mekaar deel. Die geïntegreerde metings raamwerk word gebruik om onderhoude te analiseer van die lede van 'n kennis-netwerk gevallestudie. Hierdie gevallestudie is gesentreer rondom die bedryf A Chemical Company (ACC) se kennis-netwerk. Vyf kennis-uitruil gemeenskappe van ACC se kennis-netwerk word ondersoek. Die resultate beklemtoon die dinamika tussen netwerk-lede in die proses om kennis uit te ruil.

Die gevolgtrekking van die navorsing is soos volg:

- 'n Strategie word ontwikkel wat die implimentering van die pragmatiese benadering tot kennis-bestuur beskryf.
- 'n Skedule vir die evaluering van 'n kennis-netwerk word voorgestel wat bestuur die vermoë bied om die gevolge van veranderinge in 'n kennis-netwerk te assesseer.

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GLOSSARY

ACC	A Chemicals Company
COPs	Communities of Practice
HSE	Health, Safety and Environment
ICT	Information and Communication Technology
IT	Information Technology
KIN	Knowledge intensive firm
KX	Knowledge Exchange
NOPs	Networks of Practice
QM	Quality Management



1. Introduction

This chapter introduces the field of knowledge management. The challenges regarding the integration of dispersed knowledge are discussed in the context of a scenario. Two research questions are developed that address the scenario. The research objective is stated and a methodology is developed to answer the research questions.



1.1. Background

The effective management of knowledge, as a valuable resource, within the organization is essential (Alvesson & Kärreman, 2001; Back et al., 2005; Nonaka & Ichijo, 2007). The challenge that exists for globally dispersed organizations is the integration of dispersed knowledge to create this value (Foss & Pedersen, 2004; Kogut & Zander, 1993).

If these challenges can be overcome, it enables competitive advantage for the organization (Drucker, 1999; Ipe, 2003). Additionally, the successful exploitation of knowledge creates value that can lead to innovation (Ndofor, 2004; Grant, 1996a; Grant, 1996b).

Knowledge networks play an integral role in allowing the sharing of dispersed knowledge (Brown & Duguid, 2001). The development of the Internet and Information and Communication Technology (ICT) over the past two decades has increasingly allowed the sharing of dispersed knowledge through knowledge networks.

1.2. Opposing Views

Two seemingly conflicting approaches or views of managing knowledge are discussed, i.e. the **emergent approach** and the **engineering approach**.

The **emergent approach** realizes that knowledge is contextually bound, focusing attention on the tacit nature of knowledge. Imposing structures and tools does not stimulate knowledge sharing; to the contrary it can discourage knowledge sharing. Rather, knowledge is socially embedded in the context where it takes shape and this creates meaning (Van Den Hooff & Huysman, 2009). Management's attempts to steer the knowledge sharing process has been shown to be ineffective (Hislop, 2002).

On the other hand the **engineering approach** assumes knowledge sharing can be managed. Management plays a central role in stimulating and creating an environment for this process (Van Den Hooff & Huysman, 2009). This in turn will enable organizational advantage. Thus, there exists a tension between the two approaches that requires resolving. A pragmatic approach is required to merge the opposing approaches.

The knowledge network framework by Back et al. (2005) allows the integration of both the emergent and engineering approaches to knowledge management. However the framework is a static representation of a complex and dynamic system, it cannot sufficiently assist management in the process of intervention.



A better understanding of the dynamics of knowledge sharing is required. The following hypothesis is presented to address this issue:

If the dynamics of knowledge sharing in a knowledge network can be illustrated, it will assist management greatly in deciding which interventions to implement.

1.3. Problem statement: The scenario

The following scenario guided the focus of the research:

A globally dispersed organization has implemented a knowledge network. The network has been operational for a few years and management wants to assess how effective the network is in allowing employees to share knowledge. Additionally management requires advice on how successful its interventions have been, and where further intervention is required.

The permutations of the scenario guide the development of the research problem.

It is essential to specify **what** needs to be assessed and **how** it will be measured when attempting to gauge the success of a knowledge network. Additionally one has to specify what constitutes a successful knowledge network. If these issues are addressed, it allows one to advise management as to which interventions have been successful and where further intervention is required.

The challenges presented in the scenario require the following issues to be addressed regarding the '**what**':

- An approach to knowledge management is required to navigate the landscape.
- A detailed description of the knowledge network is required to assess what a successful network entails.

Addressing the issues regarding the '**how**' requires:

- A measuring tool is required to analyze the knowledge sharing activities in the knowledge network.
- The measuring tool must enable the assessment of successful interventions by management.
- The measuring tool must shed light on where intervention is required by management

1.4. The Research Questions

In addressing the hypothesis, two research questions are developed. The two approaches to knowledge management, the **emergent approach** and the



engineering approach drives the development of these two research questions.

Knowledge is “personal, subjective, socially determined, primarily tacit, and related to daily practice” according to the emergent approach (Van Den Hooff & Huysman, 2009). People share due to being intrinsically motivated. This means that knowledge cannot be forced. The essence of this approach is the concept that knowledge sharing is determined by the social capital of a group. Thus it is the social dynamics between groups of people in an organization that determines the success of knowledge sharing not management’s involvement via intervention.

The development of the **first** research question is regarding the emergent nature of knowledge sharing. Knowledge sharing activities between people is a complex process, with many social dynamics influencing it (Van Den Hooff & Huysman, 2009). Further, research has shown that these dynamics are inter-related and influence how dispersed knowledge is integrated in a knowledge network (Agterberg et al., 2010). Thus, the first research question is concerned with this issue:

1. How do the dynamics of knowledge sharing work?

If we understand how these dynamics work it is inferred that a clearer picture will be drawn of what support is required from management.

In developing the **second** research question, the engineering approach is assessed. The engineering approach is concerned with what management’s role is regarding knowledge sharing. Defining management’s role is a delicate process, because it has been shown that attempts to directly steer knowledge processes is ineffective (Hislop, 2002). Consequently, we need to understand that management’s role entails to support an environment that fosters the ideal social dynamics for knowledge sharing (Van Den Hooff & Huysman, 2009).

2. What interventions can management implement to improve knowledge sharing in the knowledge network?

It is important to emphasize the role of the case study in this thesis. The case study is the real world representation of the scenario. It allows for rich insight into the challenges that exist at A Chemical Company¹ (ACC) and its Knowledge Exchange (KX) network. Further, the framework that is developed to measure knowledge sharing can be implemented in the context of ACC. This in turn enables us to advise ACC’s management as to what issues exist and require intervention.

¹ A Chemical Company is a fictitious name to protect the identity of the real company.



1.5. Research objective and methodology

The objective of the research is to illuminate how the intricacies of knowledge sharing occur in a knowledge network. If this process is understood, it is hypothesized that it will assist management in deciding which interventions to implement.

The research initially follows a deductive approach by **investigating** existing literature on knowledge management and knowledge networks in Chapters 2 and 3 respectively. Then a knowledge sharing analysis tool is **developed** in Chapter 4 that takes the literature discussed into account.

An inductive research approach is applied in Chapter 5. This Chapter is dedicated to the **implementation** of the knowledge sharing. The tool allows for the analysis of knowledge sharing activities in a knowledge network.

Chapter 6 contextualizes the analysis results of Chapter 5 and consequently proposes a **generalized** method to assessing management's role in a knowledge network.

The research methodology is depicted in Figure 1. The four phases of research are depicted by roman numerals (*i*, *ii*, *iii* and *iv*) and red circles depict each chapter that addresses this process.

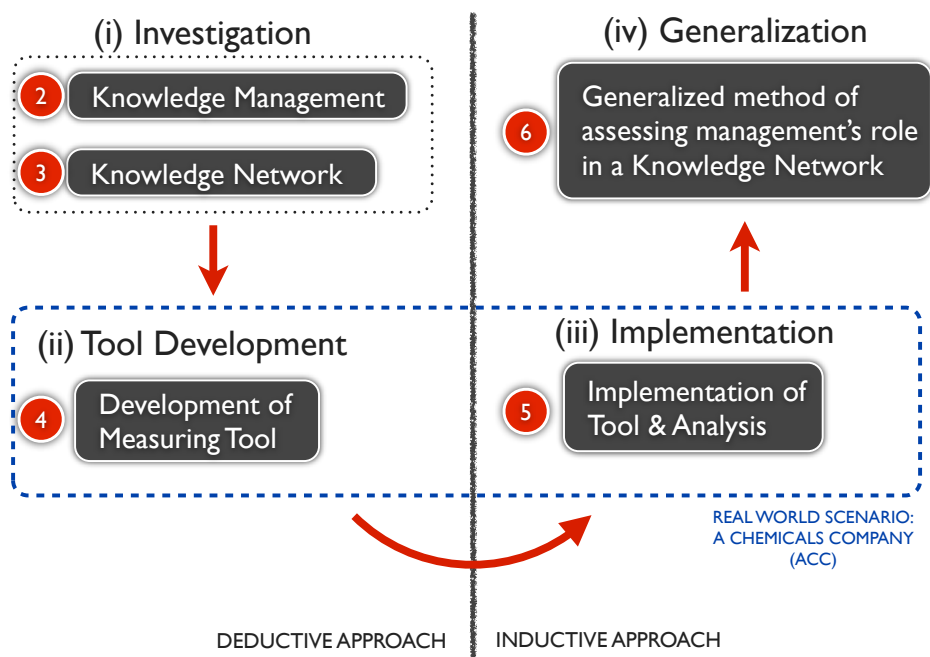


Figure 1: Research Methodology

1.6. Scope of Research

The field of knowledge management is discussed in Chapter 2. Two opposing approaches to knowledge management are examined, the emergent approach in Chapter 2.3 and the engineering approach in Chapter 2.4. The opposing approaches are at the heart of the challenges that are



encountered in knowledge management. A solution to overcome these challenges is proposed by merging the two approaches to adopt the pragmatic approach. This assists management to holistically manage knowledge in an organization.

Chapter 3 addresses the knowledge network. Knowledge networks enable people that are geographically dispersed to share knowledge. The actors, their connections, the resources required to support the interaction and the properties of the structural and cultural conditions of an organization all play a role in the knowledge network.

The knowledge network framework (Chapter 3), developed by Back et al. (2005), takes into account these aspects. It is investigated in detail to establish exactly what the knowledge sharing process entails and what Facilitating conditions must exist in a knowledge network. The facilitating conditions are mapped according to the social capital elements that must exist between members (according to the emergent approach of Chapter 2.3).

The knowledge network framework addresses the engineering approach by specifying what management's role is in establishing and supporting the ideal Facilitating Conditions.

In Chapter 4 the concept of embeddedness is introduced. This concept assists in the development of the embeddedness-measuring framework. Its purpose is to assess the social dynamics that are present between members and the content they share.

A real-life scenario in the form of a case study is introduced in Chapter 5. The interviews that were conducted at ACC are discussed. The embeddedness-measuring framework is implemented to analyze the interviews that were conducted at ACC.

The analysis process is divided into two parts. Firstly, the dynamics of knowledge sharing is illustrated to gain a better understanding into the process. Thus, focusing on addressing the first research question. Additionally interventions that management implemented are assessed and areas that require further intervention are listed.

Finally, Chapter 6 contextualizes the results of the analysis in Chapter 5 and answers the second research question.



1.7. Document layout

The layout of this document chronicles the research process that was followed. To assist the reader in this process a visual guide is presented in the header of the document. The icons represent each chapter as follows (Figure 2):

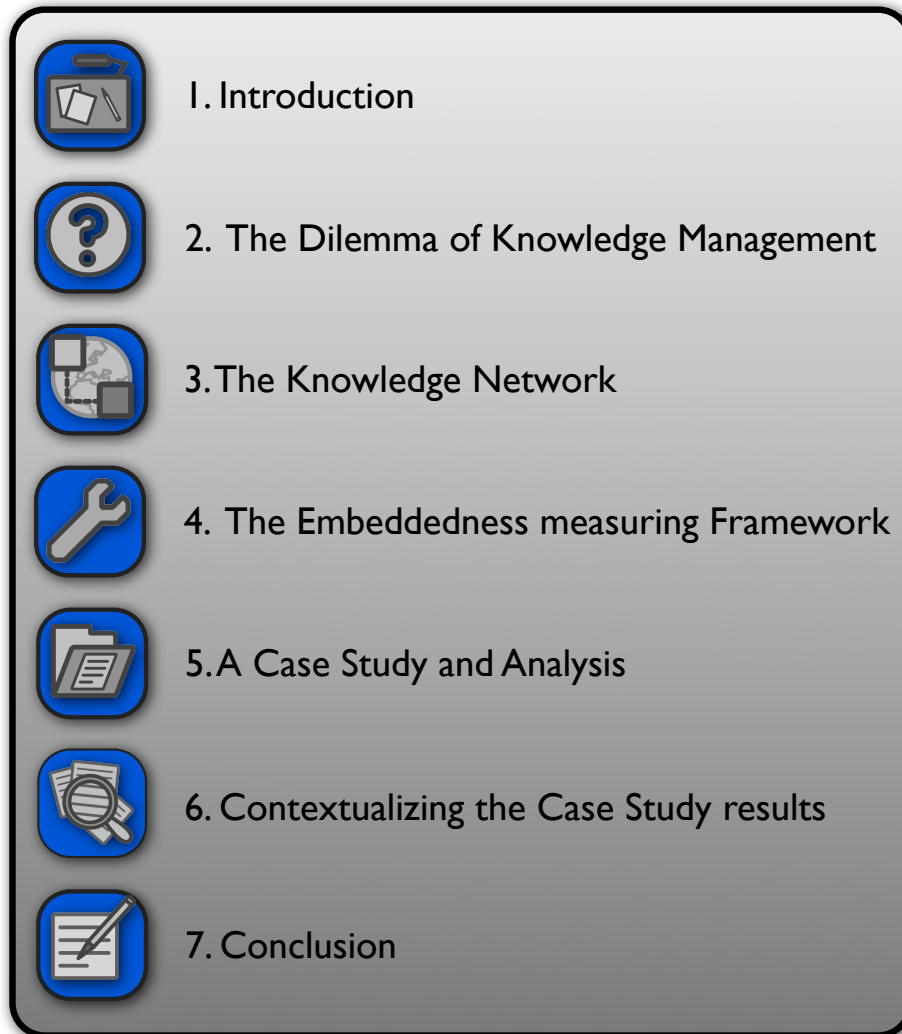


Figure 2: Icons representing each chapter



2. The dilemma of managing knowledge

This chapter assesses the knowledge management landscape. The term 'knowledge' has many divergent interpretations and it influences one's perspective of what knowledge management entails. Two divergent approaches to knowledge management are assessed, the emergent approach and engineering approach. Finally the pragmatic approach is suggested to merge these opposing views.



2.1. Defining knowledge

According to Alvesson and Kärreman (2001) the literature on knowledge management emphasizes the subjective, tacit, situational and dynamic dimensions of knowledge. Other views on knowledge are as follows:

Knowledge is always created in the present moment. Most of us cannot articulate what we know. It is largely invisible and often comes to mind when we need it to answer a question or solve a problem.

McDermott, 1999

Knowledge is a subset of information; it is subjective; it is linked to meaningful behavior; and it has tacit elements born of experience.

Leonard & Sensiper, 1998

Alvesson and Kärreman (2001) refer to five problems that occur because of the divergent views on knowledge.

- Ontological incoherence
- Vagueness
- An all-embracing and somewhat empty view on knowledge
- Objectivity and robustness
- Functionalism

It is not in the scope of this thesis to attempt to address the various views on and related problems with knowledge. Suffice it to say that one's understanding of knowledge affects how one attempts to manage it. That being said, not all views of knowledge even agree that knowledge is manageable.

Knowledge is viewed as the organization's intellectual capital and becoming more important in promoting organizational competitive advantage (Ndofo, 2004; Kogut & Zander, 1993; Nahapiet & Goshal, 1998).

It is this view that focuses the attention on knowledge creation and sharing. If one can understand how knowledge is created and shared, it should enable one to better understand the challenge of managing knowledge.

2.2. Knowledge management

The term 'knowledge management' is a relatively new concept. The emergence of communication technologies that enable access to computerized networks has made real-time interaction possible despite the physical distance (Alvesson & Kärreman, 2001). During the 1990's technologies such as the Internet, intranets, e-mail and the world-wide-web became standard organizational tools (Koenig, 1999; Hansen et al., 1999).



In the early days of knowledge management, knowledge was seen as an object that could be stored, transferred and retrieved with the aid of Information Technology (IT). However research results regarding IT's effectiveness were disappointing (Van Den Hooff & Huysman, 2009). Researchers realized that knowledge is not just a combination of information that could be de-coupled from its context. Attention shifted to taking into account the tacit dimension of knowledge. As Van Den Hooff and Huysman (2009) state: 'the fact that knowledge is socially embedded in the context where it takes shape and this creates meaning'.

Thus knowledge management is not merely managing ICT. According to Alvesson and Kärreman (2001):

'It (knowledge management) resonates well with ideas of knowledge work and knowledge intensive firms (KINs), with ideas on organizational learning, and with much thinking of organizational culture.'

Other views of knowledge management include:

Knowledge management allows connecting people, so that they can think together.

McDermott, 1999

Knowledge management is an approach to adding or creating value by more actively leveraging the know-how, experience and judgment resident within, and in many cases outside of an organization.

Ruggles, 1998

It is important to note that knowledge management has become a buzzword or an umbrella term that covers information systems, strategic management and even innovation (Alvesson & Kärreman, 2001).

Due to the complex nature of describing knowledge management a simple definition will not suffice. This "paradoxical contrast" is best discussed and analyzed in *Odd couple: Making sense of the curious concept of knowledge management* by Alvesson and Kärreman (2001). The conclusions that Alvesson and Kärreman (2001) make will hence define the author's understanding of knowledge management as follows:

- One must understand that knowledge is not just objective facts and casual explanations, but is situated in a community-based set of meanings.
- An organizational culture is required that, at its core, supports social knowledge processes.



- Management needs to understand that initiatives regarding knowledge processes are not something that can be planned or imposed, but must be fine-tuned in accordance with the culture and social practices present in an organization.

Henceforth any approach to knowledge management is viewed according to these important aspects.

Van Den Hooff and Huysman (2009) make a distinction between two approaches to knowledge management that shed light on the paradox described by Alvesson and Kärreman (2001):

- The **emergent approach** that emphasizes the practice-based view of knowledge sharing and knowledge's social nature.
- The **engineering approach** that incorporates views showing how management may influence processes concerning practice-based and socially determined knowledge.

Although they seem to be at odds with one another, it is essential to understand and incorporate both approaches to knowledge management.

In *Managing knowledge sharing: Emergent and engineering approaches*, Van Den Hooff and Huysman (2009) pose the question:

If knowledge sharing is crucial to an organization's interests, but is inherently emergent in nature, how can the organization still manage the process?

To answer this question a distinction between emergent and engineering approaches to knowledge management is made. A discussion of both approaches follows.

2.3. The emergent approach

The emergent approach views knowledge as tacit, personal, subjective, socially determined and related to daily practices (Newell et al., 2003). This means that knowledge sharing cannot be forced; rather people are intrinsically motivated to share knowledge when they are socially embedded (Van Den Hooff & Huysman, 2009). Other ways to look at it is as follows:

Knowledge sharing is not stimulated by imposing structures and tools but by rich social interaction and its immersion in practice.

Van Den Hooff & Huysman, 2009

Knowledge is highly people based

Martinez & Jarillo, 1989

According to Scarbrough and Swan (2001) communities of practice (COPs) or knowledge networks are considered to be appropriate environments for the



creation of new knowledge through knowledge sharing. Van Den Hooff and Huysman (2009) claim that current literature emphasizes ‘the importance of practice and social dynamics that result in knowledge sharing, coupled with a diminishing effect of managerial interventions’. The emergent approach essentially views knowledge sharing as not being dependent on management intervention but on the social capital of a group of people. This view is in essence a bottom-up view of knowledge management.

2.3.1. Social capital

Nahapiet and Goshal (1998) argue that, “social capital facilitates the creation of new intellectual capital”. Intellectual capital in turn is referred to as “the knowledge and knowing capability of a social collectivity, such as an organization, intellectual community or professional practice.” Organizations have developed the abilities to create and transfer knowledge that enables organizational advantage. To create and transfer knowledge effectively positive conditions that support this process need to be present. Social capital creates those positive conditions. Nahapiet and Goshal (1998) summarize it as follows (depicted in Figure 3):

- Organizations as institutional settings have many of the characteristics that enable the development of high levels of social capital.
- The co-evolution of intellectual capital and social capital that reinforce organizational advantage.

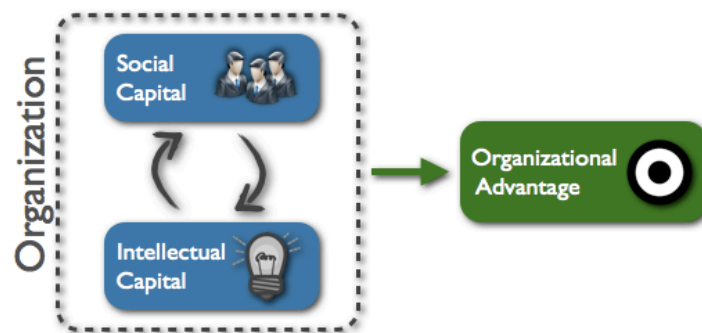


Figure 3: Working towards Organizational Advantage

Nahapiet and Goshal (1998) divided social capital into three areas to better analyze the effect it has on knowledge creation and sharing:

- S** **Structural capital:** the connections between actors – who they are and how they can be reached.
- R** **Relational capital:** assets created and leveraged through relationships: trust, norms and sanctions, obligations and expectations, identity and identification.
- C** **Cognitive capital:** resources providing shared representations, interpretations, and systems of meaning among parties – shared



language, codes and narratives.

Thus, social capital affects knowledge contribution and exchange by:

- Enabling people access to other individuals with relevant knowledge or needs and questions.
- Providing an atmosphere of mutual trust and appreciating the value of other's knowledge.
- Sharing the same paradigm that assists people to understand and correctly interpret one another's knowledge (Van Den Hooff & Huysman, 2009).

Although these dimensions are distinguished from one another, it is important to note that they are interrelated (Tsai & Ghoshal, 1998). For instance the ability for employees to interact, thus creating social ties (structural social capital), has a positive affect on trust (relational social capital), whilst it assists in the development of common goals and values (cognitive social capital). Another example is how shared meanings, goals and values (cognitive social capital) is a basis for mutual trust (Van Den Hooff & Huysman, 2009).

The elements of each dimension of social capital, according to Nahapiet and Ghoshal (1998), are summarized in Table 1 and discussed next.

Table 1: Social capital elements

Structural Capital	Relational Capital	Cognitive Capital
Network Ties	Trust	Shared language
Network Configuration	Obligations and expectations	Shared narratives
	Norms	
	Identification	

**S**

2.3.1.1. Structural capital

Network ties provide access to resources, therefore, “who you know” affects “what you know”.

Network configuration – whilst ties provide the channels for knowledge transfer, the configuration of those ties play an important role in social capital. Properties such as density, connectivity and hierarchy determine the ease and flexibility of knowledge transfer.

R

2.3.1.2. Relational capital

Trust is described as the belief that the results of somebody’s intended action will be appropriate from our point of view (Misztal, 1996). Trust increases people’s willingness to engage in social exchange and specifically in collaborative interaction.

Norms represent people’s agreement or solidarity in a social system. According to Coleman (1988), “where a norm exists and is effective, it constitutes a powerful though sometime fragile form of social capital”.

Obligations and expectations – represent a commitment from one individual to another to undertake and complete some activity in the future. Nahapiet and Goshal (1998) refer to the idea of an I.O.U. slip, where subject A can redeem a type of performance from subject B. Reciprocity is a form of confirming obligation and expectations.

Identification increases, as an individual becomes more part of a group. This happens by means of membership or through the group’s operation as a reference group. The individual assumes the “values or standards of other individuals or groups as comparative frame of reference” (Nahapiet & Goshal, 1998).

C

2.3.1.3. Cognitive capital

A **shared language** allows people to discuss and exchange information, ask questions and conduct business. Language influences our perception allowing for a frame of reference to interpret the environment around us. Sharing a language also enhances the ability to combine and create new knowledge.

Shared narratives – myths, stories and metaphors also play an important role for communities to create, exchange and preserve rich sets of meanings.



2.3.2. The emergent approach in context

Notwithstanding the fact that the emergent approach increases understanding of the components that influence knowledge sharing, it does not unravel how management's should go about increasing knowledge sharing. On the other hand, the engineering approach focuses on the management of knowledge.

2.4. The engineering approach

The engineering approach assumes that knowledge sharing can be controlled, organized and directed. Management's role is seen to stimulate and create an environment for knowledge sharing (Van Den Hooff & Huysman, 2009). Knowledge sharing can be managed in a top-down fashion, by providing the cause (vision) for sharing, means to share and right environment. In short it has a top-down approach to knowledge management.

The knowledge-based view of the organization supports the engineering approach, there is a focus by management to enable individuals and groups to create knowledge and share it with the greater organization; that will ultimately lead to competitive advantage (Grant, 1996a). Integration of dispersed knowledge is said to improve organizational learning, innovative capabilities or competitive advantage (Grant, 1996b).

But management is struggling to implement this effectively. Martinez and Jarillo (1989) argue that existing mechanisms, organizational hierarchy, contractual obligations, monetary incentives, mandated rules and regulations are unsuitable because they create formal structures that inhibit knowledge. According to Hislop (2002) empirical research and practical experience have shown that it is ineffective for management to attempt to directly steer knowledge processes.

According to Van Den Hooff and Huysman (2009) the engineering approach defines ways to support knowledge sharing processes.

'Three key infrastructures, technical, structural and cultural enable maximization of social capital.'

(Gold et al., 2001)

Management has control over the following aspects of the organization:

- **Organizational structure** – the extent to which the organization's structure facilitates knowledge sharing.
- **Organizational culture** – establishing a knowledge-friendly culture characterized by a positive orientation towards knowledge and creativity.
- **ICT infrastructure** – information and communication tools that support knowledge sharing activities.



The fact of the matter is that the above aspects do not directly influence knowledge sharing, but rather they help to create a context in which such activities are stimulated and facilitated (Van Den Hooff & Huysman, 2009).

2.5. Emergent + engineering = pragmatic approach

Merging the engineering (top-down) and emergent (bottom-up) approaches is a pragmatic method to overcome the tension that exists in knowledge management.

Pragmatism is defined as:

“An approach that assesses the truth or meaning of theories or beliefs in terms of the success of their practical application.”

New Oxford American Dictionary

The dynamics of knowledge management requires pragmatism. It is reasoned that a sensible and realistic approach is required. It is essential that a practical solution should be the result of this research.

The value of viewing knowledge management from contrasting perspectives grants the researcher:

- A better insight into the dynamics of knowledge sharing
- To view the challenges encountered in knowledge management in a holistic light

The proposed theoretical model in Figure 4 is a representation of nine hypotheses that test how the emergent and engineering approaches affect knowledge sharing (Van Den Hooff & Huysman, 2009).

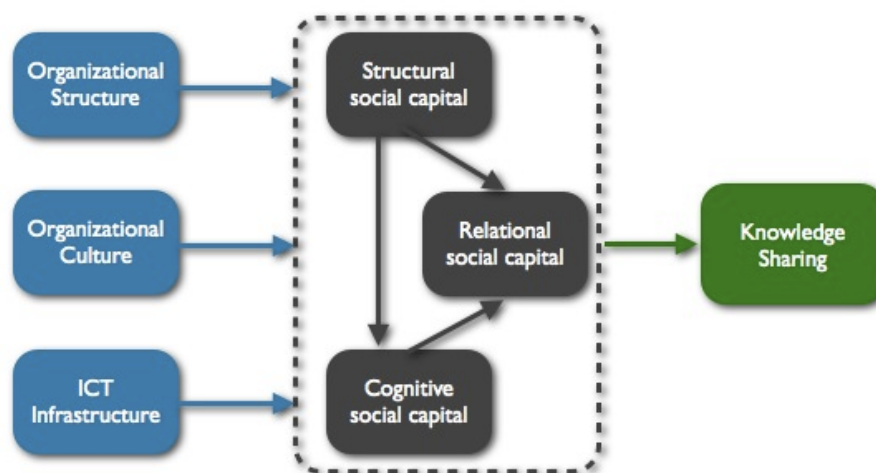


Figure 4: Theoretical model (Van Den Hooff & Huysman, 2009)

The first three hypotheses relate to social capital's role in knowledge creation:

- **Hypothesis 1:** The level of structural social capital positively influences knowledge sharing.



- **Hypothesis 2:** The level of relational social capital positively influences knowledge sharing.
- **Hypothesis 3:** The level of cognitive social capital positively influences knowledge sharing.

Next the inter-related nature of social capital is tested:

- **Hypothesis 4:** The level of structural social capital positively influences the level of relational social capital.
- **Hypothesis 5:** The level of structural social capital positively influences the level of cognitive social capital.
- **Hypothesis 6:** The level of cognitive social capital positively influences the level of relational social capital.

And finally, the areas that management can intervene in to affect influence in social capital:

- **Hypothesis 7:** The extent to which the organization's structure supports knowledge sharing, positively influences the level of (a) structural, (b) relational and (c) cognitive social capital.
- **Hypothesis 8:** A knowledge friendly culture positively influences the level of (a) structural, (b) relational and (c) cognitive social capital.
- **Hypothesis 9:** The level of ICT support in an organization positively influences the level of (a) structural, (b) relational and (c) cognitive social capital.

The theoretical model was tested by the analysis of quantitative data surveys conducted at six different organizations by Van Den Hooff and Huysman (2009).

A detailed discussion of each hypothesis is not the focus of this thesis, and thus the model's (Figure 4) results will be discussed in short. The following two pages summarize the findings of Van Den Hooff and Huysman (2009).

The first important result of the research is the emphasis on both the **emergent approach** and the **engineering approach** having an important role to play in the management of knowledge sharing.

Secondly, knowledge sharing is an emergent process and influenced by the social dynamics of individuals. Social capital plays an important role here, and the elements of social capital (structural, relational and cognitive) affect one-another dynamically (Figure 5).

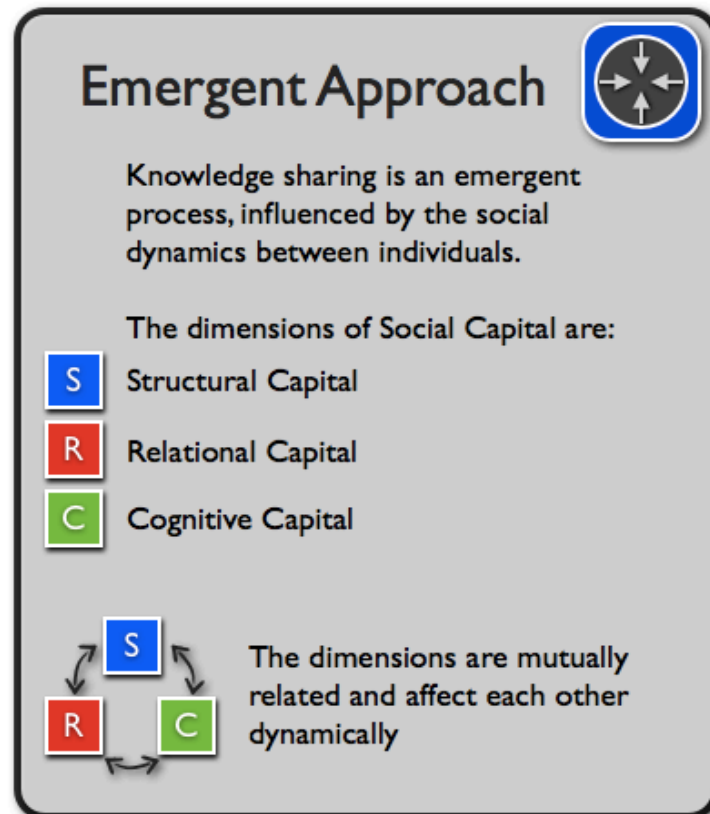


Figure 5: The emergent approach (Van Den Hooff & Huysman, 2009)



The final result from Van Den Hooff and Huysman (2009) is that the **engineering approach** enables management to establish the conditions in which emergent conditions exist. Management can facilitate, stimulate and influence the emergence of social capital which in turn influences knowledge sharing. The areas where management can do this is:

- Organizational infrastructures
- Technical infrastructures
- Establishing a knowledge-friendly organizational culture

This is summarized in Figure 6.

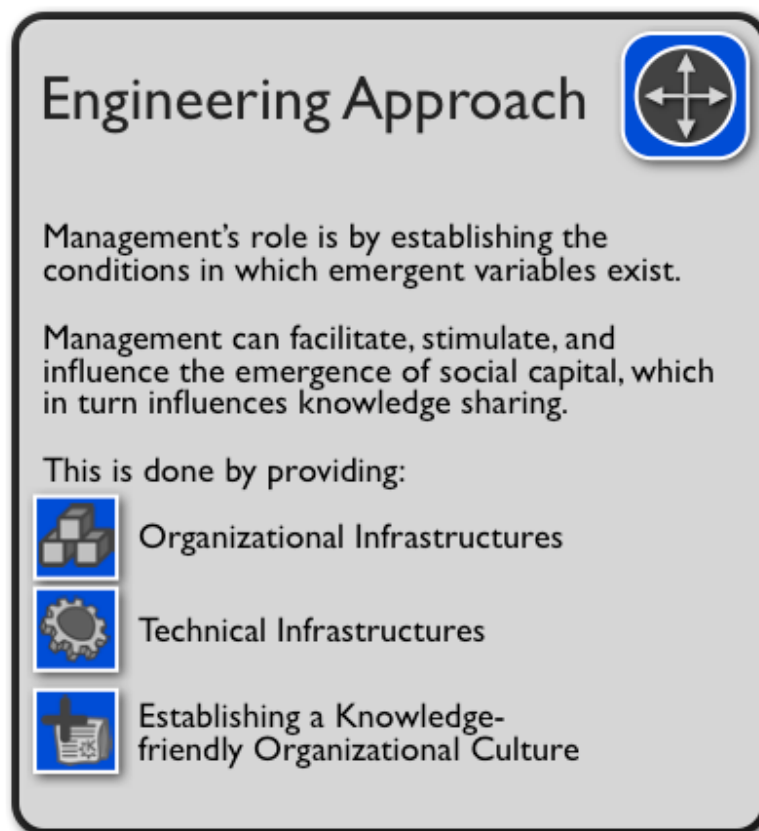


Figure 6: The engineering approach

The results of Van Den Hooff and Huysman (2009) enable the development of a pragmatic approach to navigate the complex knowledge management landscape.



2.6. Chapter conclusion

This chapter has assessed the dilemma of knowledge management. At the heart of the dilemma is opposing approaches to knowledge management. Two of these opposing approaches, the emergent and engineering approaches are discussed. A solution to the merging of these two approaches is proposed by adopting the pragmatic approach. This assists management to holistically attempt to manage knowledge in the organization.

However management requires a detailed description of the knowledge management landscape before it can attempt to navigate it. A map is required to describe the landscape in detail, whilst taking into account the variable elements of the system. The knowledge network framework developed by Back et al. (2005) addresses these issues, and is discussed in the next chapter.



3. The knowledge network

This chapter investigates knowledge networks, and briefly reviews these types of networks. The formalization of the knowledge network framework, and how it plays a central role in the management of knowledge is discussed in detail.

How the emergent approach coupled with the engineering approach can be utilized in the management of knowledge networks is then explored.



3.1. The purpose of a network

Networks exist in many forms and have different purposes. Anklam (2007) assesses various networks according to their purpose. The purpose of a network is described as follows:

The purpose of a network is that which animates it and causes its members to care about it.

Anklam, 2007

A summary of network types follows in Table 2. The intention of this table is to illustrate the various purposes that networks can acquire.

Table 2: Network types

Idea networks	Learning networks	Mission networks	Business networks
Innovation	Interest and information networks	Local service-oriented nonprofit organizations	Supplier networks
Advocacy	Communities of practice & networks of practice	Global networks	Alliances, partnerships & trade associations
	Professional associations	Regional economic networks	Independent business, consulting networks & alliances
	Research networks		Customer user groups
			Leadership networks

It is not the intention of this thesis to discuss the history of networks in general or the specific area that knowledge networks developed from.

A knowledge network is categorized under the Learning network, and it is viewed as being part of the area concerning Communities of Practice (COPs) and Networks of Practice (NOPs).

In short a knowledge network has the same purpose as a NOP in that it:

- Addresses the challenge of integrating dispersed knowledge of a geographically dispersed organization with the focus on creating value (Foss & Pedersen, 2004; Kogut & Zander, 1993).
- Organizations are the ideal environments to maximize the exploitation of new knowledge, in the form of organizational advantage and/or innovation (Back et al., 2005).



The following definition of a knowledge network will be used for the purpose of this thesis:

A knowledge network represents a number of people, resources, and the relationships among them, which are assembled to accumulate and use knowledge, primarily through knowledge creation and transfer processes, for the ultimate purpose of creating value.

Back et al., 2005

This definition is in the context of developing the knowledge network framework. This is discussed next.

3.2. The knowledge network framework

The knowledge network framework is the result of *Putting knowledge networks into practice* (Back et al., 2005). Their research output is a framework that describes the methodology, development, implementation and maintenance of knowledge networks. The knowledge network framework enables management to formalize and institutionalize a strategy to implement knowledge management.

The framework (Figure 7) takes into account the following aspects:

- **Actors** as individuals and groups
- **Relationships** between actors, which can be categorized by form, content, and intensity.
- **Resources** that may be used by actors to network with other individuals and groups.
- **Organizational properties**, including structural and cultural dimensions such as control mechanisms, standard operating-procedures, norms and values, communication patterns, etc.

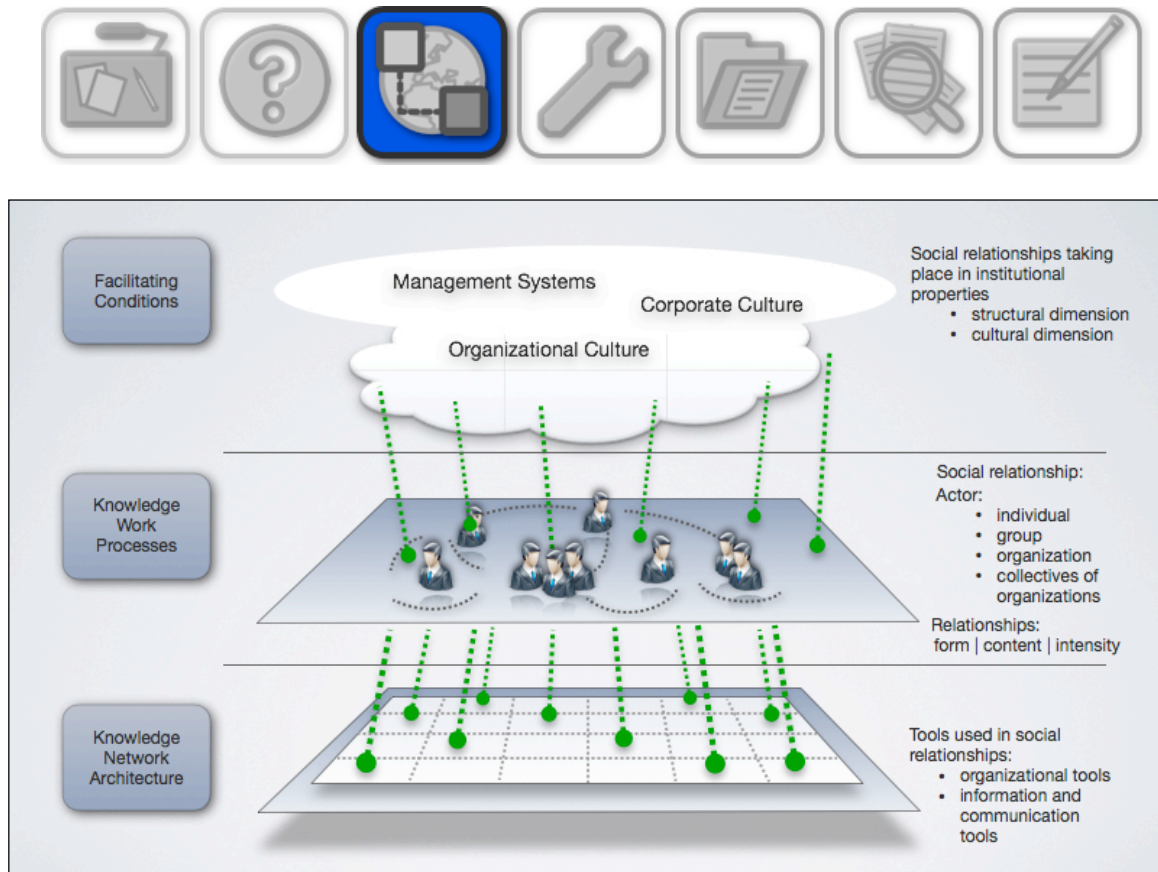


Figure 7: Layers of a knowledge network (Back et al., 2005)

The framework in Figure 7 is divided into three layers:

- **Facilitating conditions** - describes the environment in which the knowledge work processes take place.
- **Knowledge work processes** – entails the locating and capturing of knowledge, transferring and sharing of knowledge, and knowledge creation.
- **Knowledge network architecture** - ICT and organizational tools and methods that supports the knowledge work processes.

The framework's purpose is to integrate a business strategy with a knowledge network by interlinking different levels and areas of knowledge. Further it interconnects the knowledge work processes with the knowledge network architecture. Lastly it interconnects knowledge work processes and facilitating conditions.

A discussion of each layer follows in the next three sections. Firstly the knowledge work processes are focused on, as this is the focus of the knowledge network, i.e. the facilitation of knowledge creation and sharing.

Then the focus shifts to the facilitating conditions that describe the ideal environment in which the knowledge work processes thrive.

Lastly the knowledge network architecture is discussed. The architecture consists of the ICT and organizational tools that are employed in the knowledge network.



3.2.1. Knowledge work processes

Back et al. (2005) categorizes knowledge work processes in the following way:

1. Locating and capturing knowledge
2. Transferring and sharing knowledge
3. Creating knowledge
4. Applying knowledge

The **locating** and **capturing** of knowledge entails finding and mapping existing knowledge in the organization. This is a challenge in organizations with dispersed knowledge. It is often the case that problems are experienced in parts of the organization that have been solved in other areas. It results in the reinvention of the wheel. Localizing and capturing existing knowledge helps to find answers to actual problems. The maturing of ICT have eased the process of locating and capturing knowledge through examples such as forums; “knowledge maps” and “yellow pages,” which dramatically reduce search costs (Back et al., 2005).

Knowledge **sharing** and **transferring** enables knowledge to be exploited to create value (Grant, 1996a). Whilst sharing and transferring explicit² knowledge is relatively easy, the same cannot be said for tacit knowledge. Sharing tacit knowledge is more difficult, because it is deeply rooted in personal experiences, subjective insights, and values and feelings (Back et al., 2005). Furthermore tacit knowledge is shared through abstract means, such as; stories, actions, metaphors, analogies, behaviors and visions.

The process of knowledge **creation** deals with the development of new tacit or explicit knowledge by individuals or groups. Nonaka (Nonaka, 1991; Nonaka & Konno, 1998; Nonaka & Takeuchi, 1995) developed the SECI model. SECI is an acronym for socialization, externalization, combination and internalization). This model describes the creation of new knowledge through four processes:

- **Socialization** includes the exchange of tacit knowledge between individuals in order to communicate personal experience and knowledge.
- **Externalization** is the process of expressing tacit knowledge into explicit concepts.
- **Combination (systemization)** involves the transformation of different bodies of explicit knowledge into more complex and more systematized explicit knowledge.
- **Internalization** is the procedure of embodying explicit knowledge into tacit knowledge.

² Explicit knowledge is pinned down verbally in writing or electronically, reports, documents (Back et al., 2005).



The final knowledge process is then **applying** knowledge. This comprises the application and usage of knowledge in actual business situations such as decision-making or problem solving. This is described as the evolution of knowledge work processes in Figure 8.

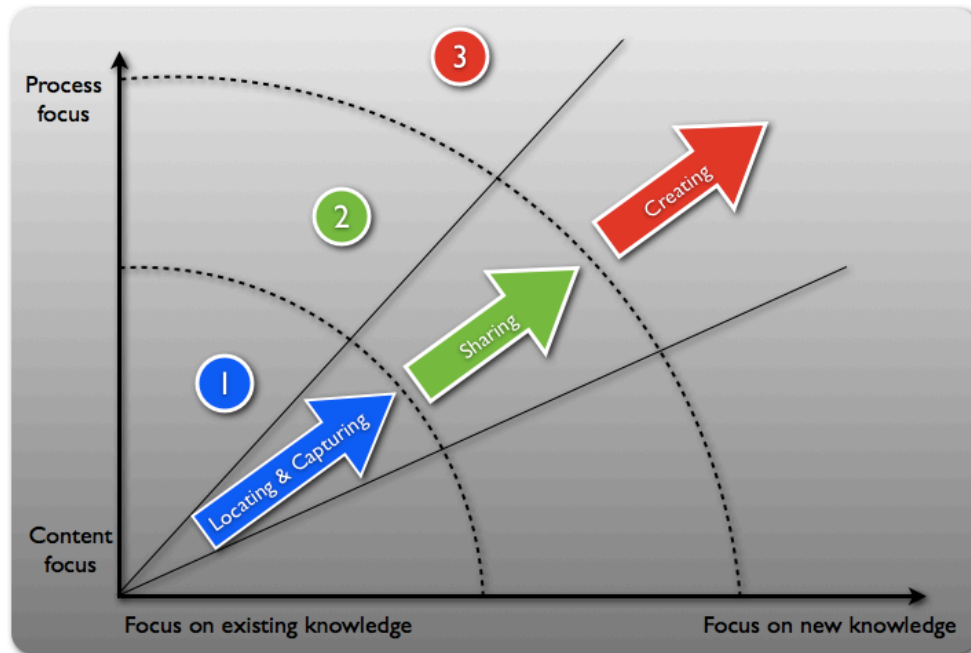


Figure 8: Evolution of knowledge work processes (Back et al., 2005).

3.2.2. Facilitating conditions

Facilitating conditions are the environment in which knowledge creation and sharing take place (Back et al., 2005). These conditions can enable or hinder the process. Back et al. (2005) distinguish between structural facilitating conditions on the network level, i.e. **network issues** and cultural facilitating conditions such as **values** and **value affecting** or **value related issues**.

The discussion and relevance of the facilitating conditions will be done in the context of the three aspects of social capital:

- Structural capital
- Relational capital
- Cognitive capital



As a visual aid, the following coloured squares will be used to represent each of the three forms of social capital:



3.2.2.1. Network issues

The network issues are derived from the characteristics of a network.

Skills and experience in the network

S Employee's existing experiences and skills play an important role in the knowledge sharing/transfer process. The reason for this is that the ability to discern and comprehend transferred knowledge is interconnected with existing skills, knowledge and experiences (Cohen & Levinthal, 1990).

Task orientation and roles of members in the network

S By defining knowledge creation/sharing explicitly as a task, in the same vein as existing daily tasks and promoting such knowledge tasks as essential for the network and organization as a whole, will, in the end, support knowledge processes.

Size and formalization of networks

S The size of a network influences the connectedness of its members. The bigger a network the more connections members have, but those connections become increasingly loose. This is not a negative aspect, it is just important that the network provide the appropriate tools according to the size of the network. Small networks function with more personal and informal structures, whilst bigger networks require more formalized communication tools and methods.

Geographical scope and proximity

R The nature of geographically dispersed networks causes problems in sharing knowledge. Members have much less face-to-face contact that negatively affects relational capital. Additionally, due to globalization multi-national organizations employ people with different cultural backgrounds that do not necessarily speak the same mother tongue. These cognitive capital issues can frustrate knowledge sharing via the network.

Relationships

R Healthy relationships between people are as essential for knowledge sharing as water is to the earth. Aspects regarding relational capital such as trust, identification, norms and expectations have a major influence on the relationships between colleagues.



Openness and entry barriers

R

There needs to exist an openness of network members to willingly communicate with one another. Therefore open boundaries of networks can facilitate creation/sharing activities between networks, while closed boundaries are hindering them.

Identification, commitment of the members towards the network and multi-membership

R

The establishment of a group feeling between members is essential. Whilst members' identification with a network assists in creating the commitment of members towards their "own" network. There exists the danger that members could get tunnel vision. Their commitment to the network is so strong that they do not share knowledge outside their network community, even though there may be overlapping and relevant issues in other network communities. A solution to this issue is allowing members to have multi-memberships of network communities. Thus exposing them to more issues related to their work, in turn allowing more knowledge to be shared. Multi-membership is related to a person's job description and role. A manager for instance will typically have multi-membership as their roles demand divided attention from various departments.

Shared norms, values and language

R

Having similar norms and values, be it in a personal capacity or a cultural capacity supports knowledge work processes in a network. This assists similar understandings and behaviours to develop and forms communication patterns in the network (Back et al., 2005). Also, a common language will greatly assist knowledge creation/sharing in a network.

C

Shared objectives, aims and interests

C

Objectives, aims, and interests in networks must sync with knowledge creation/sharing goals and activities. Synchronization is essential for motivating members to share knowledge, without this, motivation dwindles as conflicts of interest may arise as to the importance of knowledge shared. Also, the vision and goals for knowledge sharing should be the guiding force for members to be active in the network.

Communication style, tools and media richness

According to Wenger (1998) specific communication styles exist within networks, and members know best how to communicate and to share/transfer knowledge. Additionally, media richness enhances the knowledge sharing experience, for instance, complimentary media that has a positive impact on sharing and transferring activities within networks.



Type of knowledge

Knowledge can be viewed as having either an explicit or tacit nature. Explicit knowledge is schematic in nature, thus making it easier to transfer than tacit knowledge in a network. Yet networks must support both the sharing of explicit and tacit knowledge. The nature of the knowledge shared plays a big role in what support aspects are required from the network.

3.2.2.2. Values

The New Oxford American dictionary defines values as “a person’s principles or standards of behavior”. Erik and Hall (1994) state: “Values are filters by which we make decisions.” There are specific values that must be present in a network and shared by all members. If members do not have the same principles regarding knowledge sharing, the process is negatively affected. Back et al. (2005) specified the following values as being imperative to the success of a knowledge network.

Trust

R

Trust is the foundation of any relationship that allows for knowledge sharing. It is a key element regarding relational capital. Relationships with high levels of trust allow people to engage socially, cooperate and work together (Nahapiet & Ghoshal, 1998). From this knowledge sharing occurs naturally. Trust also has a central role to play in strengthening other values. For instance a two-way interaction is present between trust and cooperation. Trust facilitates cooperation, whilst with increased cooperation; trust is built (Nahapiet & Ghoshal, 1998).

Care and responsibility

R

Caring includes being responsible for new information, preparing sufficiently for a knowledge process, ensuring quality of information shared. This requires members to take responsibility for their own actions but also on an organization wide basis regarding knowledge sharing activities. Nahapiet and Ghoshal (1998) refer to obligations, a commitment or duty to undertake some activity in the future. This is very much part of relational capital.

Intrinsic motivation

R

“The decision to rely on and enable intrinsic motivation depends strongly on the need to generate and transfer tacit knowledge” (Osterloh & Frey, 2000). The transfer of tacit knowledge is very difficult to observe or measure, making it impossible to attribute the output or results of tacit knowledge sharing to a single individual. This is important to note as managers attempt to motivate members to share knowledge. Personal relationships strongly raise the intrinsic motivation to cooperate (Osterloh & Frey, 2000), thus rooting it firmly in the relational capital dimension.



Tolerance for mistakes or need for help

- R** Allowing space for mistakes and having an atmosphere of 'no question is a stupid question' is essential to create a positive knowledge sharing environment. If people are afraid to make mistakes, knowledge sharing is negatively affected. A culture of helping one another also plays an important role. Elements of reciprocity are evident here as well.
- C**

Communication, cooperation and collaboration

- R** Since much knowledge is transferred via different forms of communication, it is another essential aspect to the success of a knowledge network. Communication is a prerequisite for people to cooperate and collaborate. High levels of cooperation and collaboration often help to establish common grounds (a group feeling) for knowledge processes. Cooperation and collaboration as with many other values go hand in hand, for instance trust increases through successful cooperation and collaboration.

A summary of the network issues and values that are essential to the knowledge network framework is presented in Table 3. The network issues and values are listed according to their relevance regarding the aspects of social capital.

Table 3: Network issues and values mapped to social capital

	Structural Capital	Relational Capital	Cognitive Capital
Network Issues	Skills and Experience in the Network	Geographical Scope and Proximity	Geographical Scope and Proximity
	Task Orientation and Roles of Members in the Network	Relationships	Shared Norms, Values and Language
	Size and Formalization of Networks	Openness and Entry Barriers	
		Identification, Commitment of the Members towards Network and Multi-Membership	
		Shared Norms, Values and Language	
Values		Shared Objectives, Aims and Interests	
		Trust	Tolerance for Mistakes or Need for Help
		Care and Responsibility	
		Intrinsic Motivation	
		Tolerance for Mistakes or Need for Help	
		Communication, Cooperation and Collaboration	



3.2.2.3. Value related issues

The success of implementing knowledge management is in understanding what role management has to play with regard to supporting the conditions and values required in a knowledge network. Back et al. (2005) identify the following components that management needs to be aware of that relate and affect the **network issues** and the **values** that need to be present in it.

Knowledge culture

An established knowledge culture facilitates the creation and sharing of knowledge (Back et al., 2005). Creating such a culture takes time and it is essential that top management drives the establishment and continued support of such a culture.

Value of knowledge transfer by itself

Management must emphasize the importance of knowledge sharing and its value to the organization. The knowledge sharing vision should be well defined and part of the business strategy.

Communication of knowledge transfer

Issues regarding knowledge creation and sharing should be clearly communicated to network members. The purpose and goals concerning knowledge sharing need to be clearly articulated.

Time and resources

If knowledge sharing is propagated as being beneficial for the organization, time and resources should be provided and allocated. Knowledge sharing should be part of employees' daily tasks. Without the necessary resources and lack of allocated time knowledge sharing is negatively affected.

Extrinsic motivation and incentives

Rewarding mechanisms such as bonus incentives have been shown to positively affect extrinsic motivation for sharing knowledge. Yet is important to note that this relates to explicit knowledge, as it is 'tradable', meaning that managers are more able to observe how individuals have performed with regard to sharing explicit knowledge (Osterloh & Frey, 2000).

Appraisal

Appraisal methods attempt to measure knowledge sharing activities in the knowledge network. Appraisal of members' knowledge sharing activities sheds light on who is interacting with whom. Network analysis techniques shed light on the structure of the network. Issues regarding density, connectivity and activity levels of members can be measured.

Training and education

It is important for an organization to educate and train existing and new employees in "knowledge work" and transmitting the "values of a knowledge



culture". Training new employees in the use of the network is also important to get them to use it.

Personal market value of employees

Employees could feel that sharing their knowledge makes them less valuable, even replaceable. Therefore it could negatively affect knowledge sharing. This is compounded if employees are rewarded specifically on individual excellence. In a knowledge-friendly company it is important for management to emphasize that employee value increases as more knowledge is shared because of the network effect. As a member increasingly shares and connects with others via the network he or she becomes more valuable and central to the knowledge sharing activities of the organization.

Management

Back et al. (2005) acknowledge that management's activities and/or abilities to support knowledge sharing in the organization are diverse. Management can be a role model by sharing knowledge; this has a motivating effect on other members. Giving recognition to those that are active contributors is another way that management can motivate members to sharing knowledge.

These network related issues are summarized in Table 4:

Table 4: Network related issues

Value related issues
Knowledge Culture
Value of knowledge creation/transfer by itself
Communication of knowledge transfer
Time and Resources
Extrinsic Motivation and Incentives
Appraisal
Training and Education
Personal market value of employees
Management

3.2.3. Knowledge network architecture

Back et al. (2005) describes the knowledge network architecture as ICT and organizational tools, and their ability to support knowledge networks.



ICT addresses the fact that knowledge creation and transfer occurs increasingly in different time zones and different physical places. Thus the success of a knowledge network lies in an organization's ability to effectively use modern ICT (Back et al., 2005).

Deciding which ICT should be implemented is a complex task. Vendors and producers of ICT constantly sell their products as having unlimited possibilities, but many examples exist of failed implementations (Back et al., 2005). There are various reasons for this; in many cases the wrong tools are implemented. At times, failure is due to the human element, i.e. sometimes people simply do not like the new tools. The impact of the implemented tools is also not well measured, thus making the assessment process difficult.

It is with keeping this complex process in mind that Back et al. (2005) propose the combination of ICT and organizational tools (Figure 9). The requirements of each organization are unique, requiring in-depth analysis into what is required and how those requirements should be addressed.



Figure 9: Classification model for ICT & organizational tools (Back et al., 2005)

Back et al. (2005) create a classification model that has four main tool classes. Specific tools are then classified for each of these classes.

Due to the complexities of this process and the large scale of possible solutions it was decided to not focus on ICT and organizational tools further in the research. The reasoning for this was that in the context of the research questions it is not the main concern. This does not mean it will not be taken into account; it is merely a case of keeping the research inline with the research questions. It is also not in the scope of this thesis to address the ICT and organizational tools.



3.3. Challenges to managing a knowledge network

The knowledge network framework contextualizes the knowledge network with regard to:

- The occurrence of knowledge work processes
- The environment these processes require in the form of facilitating conditions
- The ICT and organizational tools that are required to support the processes

By applying the emergent approach an analysis of the facilitating conditions of the framework was done (Table 3, page 30). This enables us to specify what social capital (structural, relational and cognitive) dimensions are related to each network issue and value.

In the discussion of the facilitating conditions in a knowledge network, Back et al. (2005) mention the inter-related connections between conditions. Additionally the value related issues that management can affect are discussed. Yet no connection is made between the value related issues and the network issues and values. Thus management has no method of analyzing the success or reasons for failure of interventions, because of the dynamics of the facilitating conditions. Therefore the framework describes the environment, but its description is of a static landscape.

Accordingly the framework does not support the emergent approach sufficiently. The crux of the emergent approach, as concluded in Chapter 2.5, is that:

- Social capital is at the heart of individuals' social interaction when sharing knowledge
- The dimensions of social capital are inter-related and affect each other dynamically



It is concluded that further investigation is required to answer the first research question, as depicted by Figure 10:

How do the dynamics of knowledge sharing work?

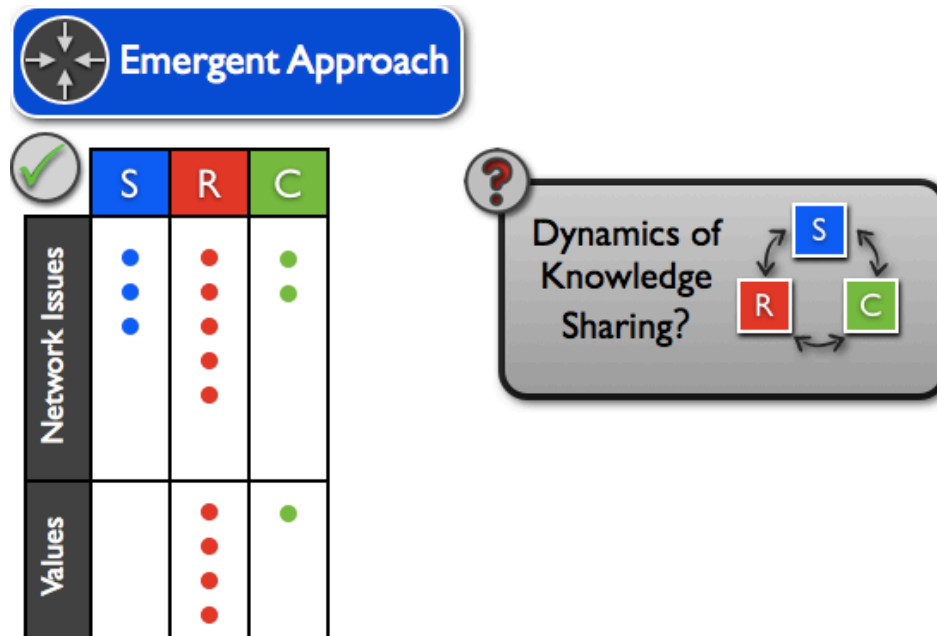


Figure 10: The knowledge network framework vs the emergent approach

Additionally the framework specifies that management can affect interventions to certain areas that will influence the actors, relationships, organizational properties and resources in the knowledge network. Essentially, management is responsible for the organizational infrastructures regarding the knowledge network.

Management can affect change in the facilitating conditions by intervening through the **value related issues** (Table 4, page 32), thus indirectly affecting knowledge sharing. One of the specific outputs of the **value related issues** is the establishment of a knowledge-friendly organizational culture.

Also, management is responsible for strategizing, implementing and maintaining the knowledge network architecture (i.e. technical infrastructure). The ICT and organizational tools that need to function in unison is a very complex process. This requires an exhaustive analysis of the organization, and is unique to every organization.

So these three mechanisms that are represented in the framework characterize the **engineering approach**, as concluded in Chapter 2.5:

- Organizational infrastructures
- Establishment of a knowledge-friendly organizational culture.
- Technical infrastructure



However the framework does not clarify how management interventions affect a dynamic system (as described by the **emergent approach**), thus it cannot answer the second research question (Figure 11):

What interventions can management implement to improve knowledge sharing in a knowledge network?

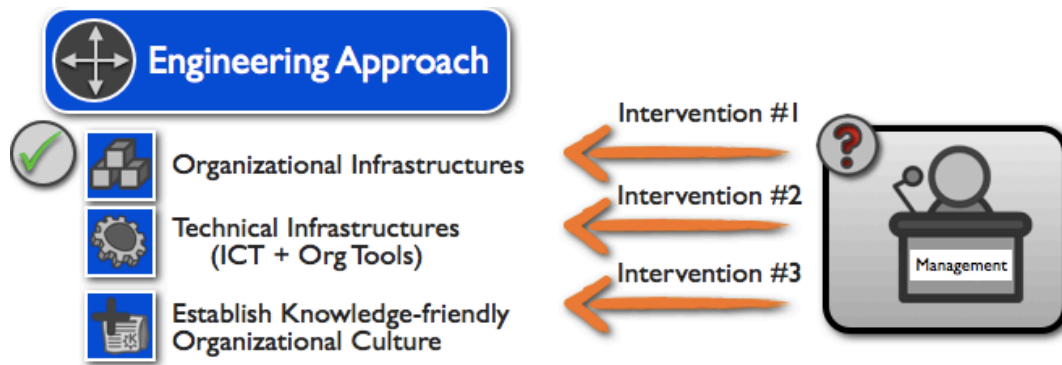


Figure 11: The knowledge network framework vs the engineering approach

3.4. Chapter conclusion

This chapter has assessed the knowledge network. The knowledge network framework plays a central role in managing knowledge sharing in a dispersed organization and a detailed analysis of the framework has been discussed. A comparative mapping of the facilitating conditions and social capital is presented by adopting the emergent approach. Additionally, it highlights areas of the knowledge network that management can intervene in. The areas of intervention that management has control over is attributed to the engineering approach.

In conclusion the chapter assesses how the respective research questions are to be addressed. It is found that the framework is not sufficiently dynamic to assist in explaining the dynamics of social interaction between its members. Furthermore, although it highlights areas that management can intervene in, it does not account for the interconnected nature of a knowledge network. The conclusion is that an accurate measuring tool is required to analyze these dynamics that are at work.

The development of a knowledge measurement tool is discussed in the next chapter.



4. The embeddedness measurement framework

This chapter discusses the development of the embeddedness measurement framework. The purpose of the framework is to measure the social dynamics that are present between members, and the content that is shared between members. The framework consists of five forms of embeddedness, and each one is discussed in more detail.



4.1. Measuring knowledge sharing

It is no simple feat to measure the dynamics of the knowledge sharing process. Yet in the context of the scenario described in Chapter 1.3, it is important to show these dynamics of knowledge sharing at work, for this lies at the core of making sense how management can assess the success of its interventions and decide where further interventions are required. This Chapter addresses this issue by developing such a tool. The development of this tool will then be implemented in a case study in Chapter 5.

The article, *Keeping the wheels turning: The dynamics of managing networks of practice*, Agterberg et al. (2010) addresses a similar challenge. To answer to the question: 'How can intra-organizational networks of practice be managed without being killed?' Agterberg et al. (2010) propose the concept of embeddedness. The definition of 'embed' is:

Causing something to be an integral part of a surrounding whole.

American Heritage Dictionary

The concept of embeddedness assists Agterberg et al. (2010) to unravel the dynamics of knowledge sharing in networks of practice (NOPs). The four different forms of embeddedness that are distinguished are shown to interact dynamically. It also assists in unraveling how interventions by management indirectly affect knowledge sharing.

The forms of embeddedness are distinguished by either being **content** orientated or **connections** orientated.

Content (Figure 12) relates to knowledge that is embedded in ideas and concepts (tacit knowledge), reports, strategies and discussions. It also refers to forums discussions or emails (explicit knowledge) that are shared between members in a certain environment. The two forms of embeddedness that are related to content are:

- **Organizational embeddedness:** to what degree the knowledge shared in the network has relevance and to what degree is it integrated in the formal organization.
- **Embeddedness in practice:** to what degree the knowledge shared in the network has relevance for network members. Additionally how knowledge shared is integrated in the local practices of network members.



Figure 12: Forms of embeddedness concerning content

Connections (Figure 13) refer to how members are embedded in the network and how their relationships are supported.

- **Relational embeddedness:** the extent to which the network is characterized by strong social ties (Granovetter, 1985) and elements such as trust, mutual expectations and identification (Nahapiet & Goshal, 1998).
- **Structural embeddedness:** the extent to which network members are connected to one another (Granovetter, 1985) and know who knows what and how to reach them (Contractor & Monge, 2002; Nahapiet & Goshal, 1998).
- **Cognitive embeddedness:** the extent to which network members share the same language and culture. Agterberg et al. (2010) did not measure the cognitive social capital element in their study. It is proposed though that it is essential to include it.

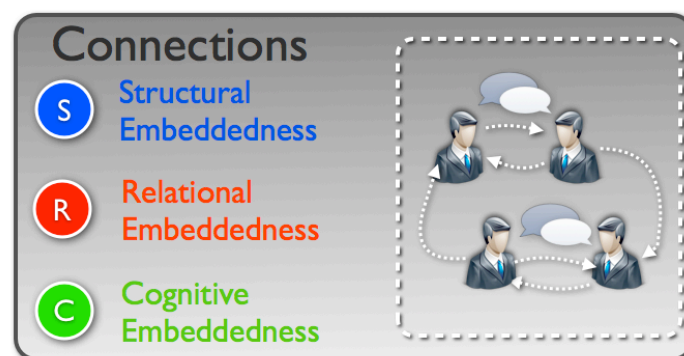


Figure 13: Forms of embeddedness concerning connections

Furthermore, these forms of embeddedness influence the way NOPs integrate dispersed knowledge.

Agterberg et al. (2010) develops a model in the article: *Managing intra-organizational networks of practice: dynamics and interventions* (Agterberg et al., 2010). The model illustrates the dynamic interrelatedness (pulleys connected by belts) among the forms of embeddedness and knowledge



sharing in Figure 14. All four forms interact to enable knowledge sharing. It is proposed that management can intervene in each of these forms. Intervention can result in higher or lower levels of embeddedness (respectively turning clockwise and anti-clockwise). Because of the inter-related nature of the forms of embeddedness an intervention that increases one form of embeddedness could have a negative effect on another form. This could in turn ultimately result in decreasing knowledge sharing.

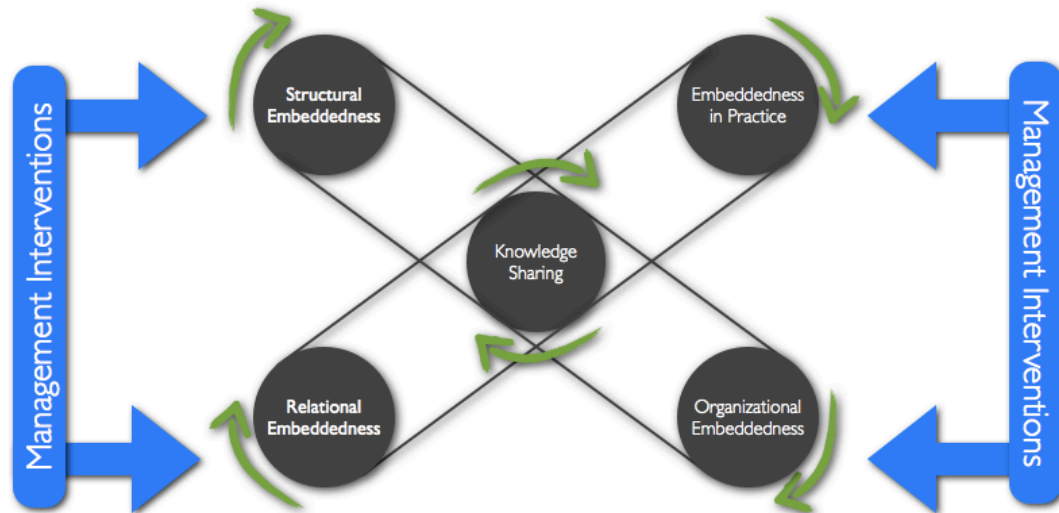


Figure 14: Managing intra-organizational networks of practice: dynamics and interventions (Agterberg et al., 2010)

Each form of embeddedness is now discussed. Then the forms of embeddedness are discussed that will assist in creating a more dynamic view of the knowledge network framework.



4.1.1. Organizational embeddedness

Organizational embeddedness refers to the extent to which the knowledge being created and shared in knowledge networks is integrated in and relevant to the organization of which these networks are a part. There are two main elements to organizational embeddedness:

- **Institutionalization** - Extent to which outcomes of the network can be applied in the formal organization as rules, routines and strategies.
- **Relevance for organization** - Extent to which knowledge sharing in the network is considered valuable for the organization.

Agterberg et al. (2010) find a dynamic relationship between organizational embeddedness and knowledge sharing. As more knowledge is shared in a network, more can be institutionalized via practices and routines. The reverse is also true, as knowledge is institutionalized; it positively influences knowledge sharing, because it affirms that network activity is important.



P

4.1.2. Embeddedness in practice

The embeddedness in practice construct relates to the degree to which the knowledge being created and shared in a knowledge network is integrated in, and relevant to members' local practices. There are two elements that make up embeddedness in practice:

- **Relevance to practice** - Extent to which knowledge sharing in the network is immersed in the daily local practices of members.
- **Common practices** - Extent to which the network members use the same practices.

When members have divergent knowledge interests their need to share knowledge decreases. Divergent local practices cause people to have different interests. These divergent practices cause members to share less, as they feel that their knowledge is only relevant to local practices and sharing it with other members is not of any value. So the less relevant members perceive knowledge to be, the less inclined they will be to share.

The contrary is true as well, if common practices exist between different locations, sharing that knowledge can add much value. In the process re-inventing the wheel can be prevented. This in turn enables the establishment of organization-wide best practices.

S

4.1.3. Structural embeddedness

Structural embeddedness relates to how connections are structured between people. Structural embeddedness is divided into:

- **Connectedness** – extent to which members are connected to each another.
- **Know who is where and knows what** – extent to which members know who knows what in the network and how they reach these people.

Knowledge networks assist in connecting people who might have been working in isolation. It increases the structure of connections between people, i.e. structural embeddedness. It relates directly to structural social capital and is concerned with who knows what, and how they can be reached.

Structural embeddedness and knowledge sharing has a self-reinforcing relationship. The more people connect with one another, the more they engage in sharing knowledge in the knowledge network. This increase in sharing also helps members to know who knows what.



R

4.1.4. Relational embeddedness

The presence of strong social ties in a knowledge network (Granovetter, 1985) relates strongly to knowledge sharing. This directly relates to relational social capital, the following elements are seen as essential:

- **Trust** – extent to which members feel safe and trust each other in the network.
- **Reciprocity** – willingness of members to help one another.
- **Group feeling** – extent to which network members identify with a group and feel part of it.
- **Face-to-face contact** – amount of time spent and possibilities to meet face-to-face among members in the network.
- **Openness** – the extent to which members are open to sharing knowledge, the opposite is a member who values his or her knowledge so much that they feel it gives them power/leverage by not sharing

Feelings of group identity and trust enhance member's motivation to share knowledge and also assists the strengthening of social ties in the network.

Face-to-face meetings, such as kick-off meetings help members to get to know one another. This motivates people to share knowledge via the network. Social interaction helps to build a group feeling, with the forming of common vocabularies, symbols and norms. This group feeling enables members' ability to share more.

Reciprocity is essential as it increases members' willingness to share. On the other hand if they feel they share a lot without getting anything in return, their enthusiasm to share will diminish.

C

4.1.5. Cognitive embeddedness

Cognitive embeddedness is an additional form of embeddedness that will be included. Agterberg et al. (2010) do not recognize cognitive embeddedness, although in the author's opinion essential to measure the aspects that it addresses concerning knowledge sharing. Elements of cognitive social capital were identified in the facilitating conditions (Table 3, page 30) of the knowledge network framework. The aspects of cognitive embeddedness are summarized as follows:

- **Shared language and culture** - extent to which a shared language and culture enables or prohibits members to share knowledge. Cultural context, expressions and shared interpretations are influential.
- **Shared technical language** - the ability to understand technical jargon. It can be specific to an industry, job role or experience.
- **Shared organizational culture** – extent to which the organization has a knowledge culture.



Figure 15 summarizes the five forms of embeddedness that have been discussed. The forms of embeddedness are grouped according to the content or connections aspect that each forms relates to:

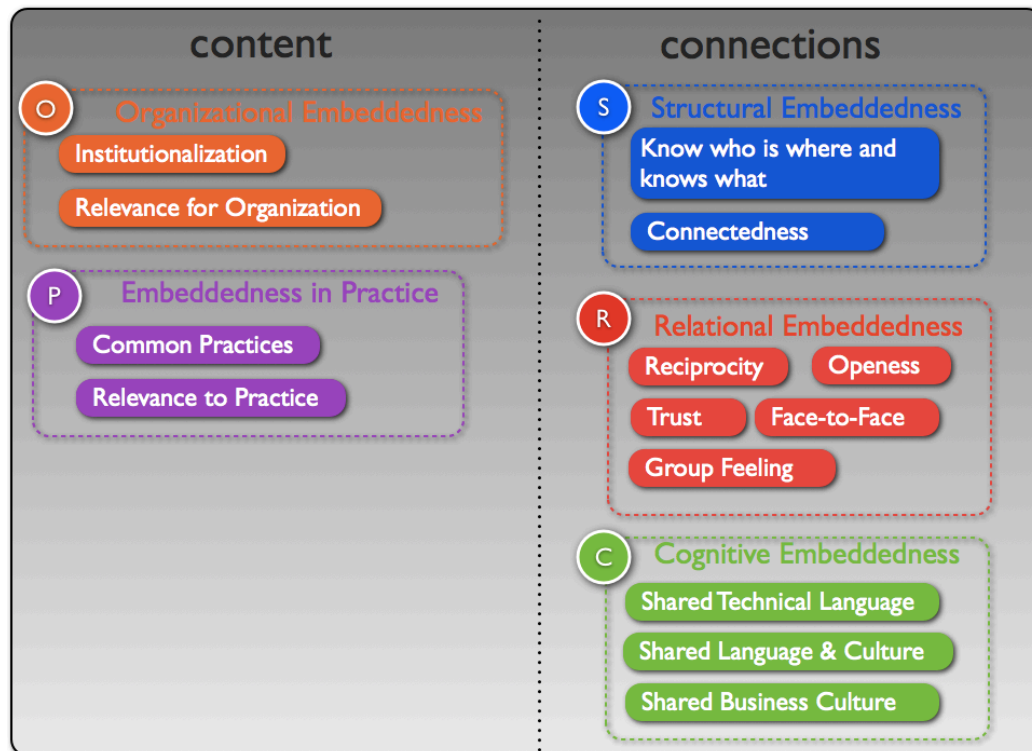


Figure 15: Connections vs Content

Organizational embeddedness and embeddedness in practice are related to content that is created. Structural, relational and cognitive embeddedness are concerned with the connections between people, and how those connections are strengthened when the aspects of social capital are supported in a network.

The four forms of embeddedness highlighted by Agterberg et al. (2010) plus cognitive embeddedness clarify the dynamic interaction that is present during knowledge sharing. This enables one to address the first research question:

1. How do the dynamics of knowledge sharing work?

With regard to answering the second research question:

2. How do interventions by management affect knowledge sharing in a knowledge network?

The pragmatic approach, discussed in Chapter 2.5, is required to navigate through the complex landscape of knowledge management. The knowledge network framework describes this landscape. Yet, as noted in Chapter 3.3 (page 34), the framework does not address the dynamics that are present in a knowledge network.



4.2.A dynamic framework

For the purpose of analyzing knowledge sharing, a framework is required that addresses this. The knowledge network framework was not intended to measure the dynamics of knowledge sharing. However it is a good departure point for assessing the dynamics that are present in a knowledge network.

The proposed solution is the embeddedness-measuring framework (Figure 16). It assumes the layers of the knowledge network framework:

- **Facilitating conditions**
- **Knowledge work processes**
- **Knowledge network architecture**

Firstly, the **connections** aspect concerning structural, relational and cognitive embeddedness is discussed. The analysis of the facilitating conditions in Chapter 3.2.2 and its summary in Table 3 (page 30) is directly related to structural, relational and cognitive capital. This enables us to analyze the social dynamics that exist between members in a knowledge network. Thus we place structural, relational and cognitive embeddedness that represent the connections between members in the facilitating conditions layer of the knowledge network framework (Figure 16).

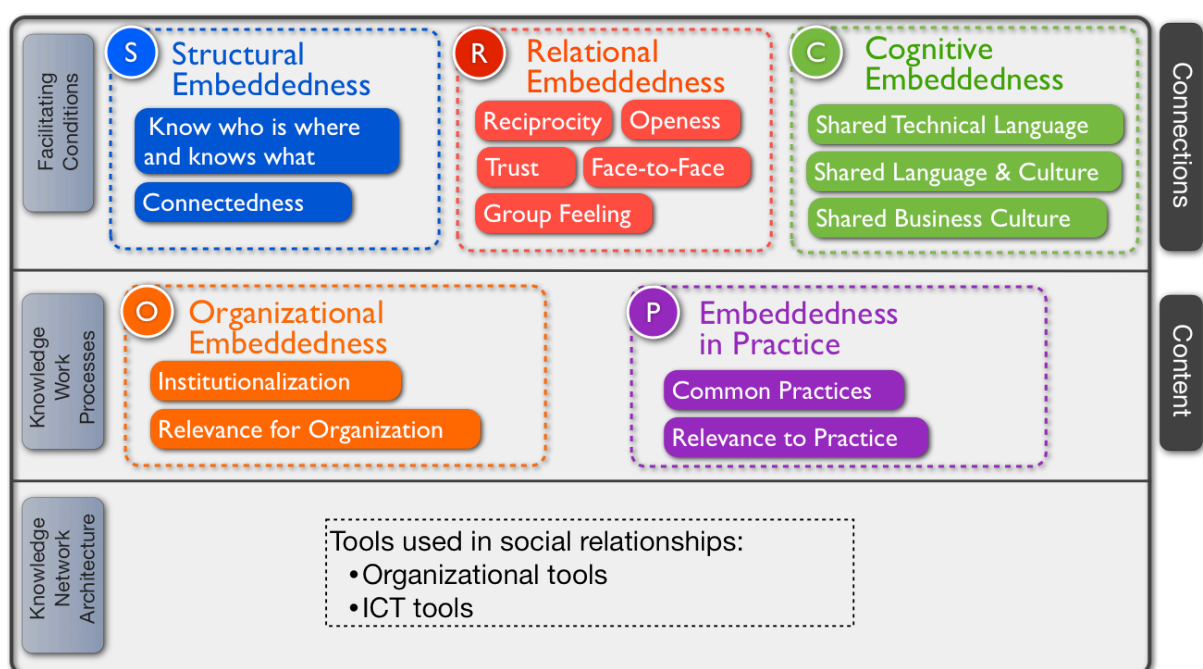


Figure 16: The embeddedness-measuring framework

With regard to **content** shared between network members organizational embeddedness and embeddedness in practice are placed in the knowledge work processes layer of the knowledge network framework (Figure 16). Thus assisting in gaining additional insight of the knowledge work processes (Chapter 3.2.1) that occur in the knowledge network.



The knowledge network architecture will not assist in assessing knowledge sharing activities. It will, however, be included in the embeddedness-measuring framework as ICT and organizational tools play an important supporting role. Although the knowledge network architecture layer does not directly influence knowledge sharing, it does allow management additional areas of intervention. Yet as was noted in Chapter 3.2.3, the knowledge network architecture is not the focus of the research in this thesis.

The embeddedness-measuring framework enables management to zoom into the ground level view of the knowledge network and analyze in detail what is occurring regarding knowledge sharing. Thus assisting in answering the first research question.

1. How do the dynamics of knowledge sharing work?

This is depicted in Figure 17. Additionally, the embeddedness-measuring framework is put into practice when analyzing the dynamics of knowledge sharing in Chapter 5.

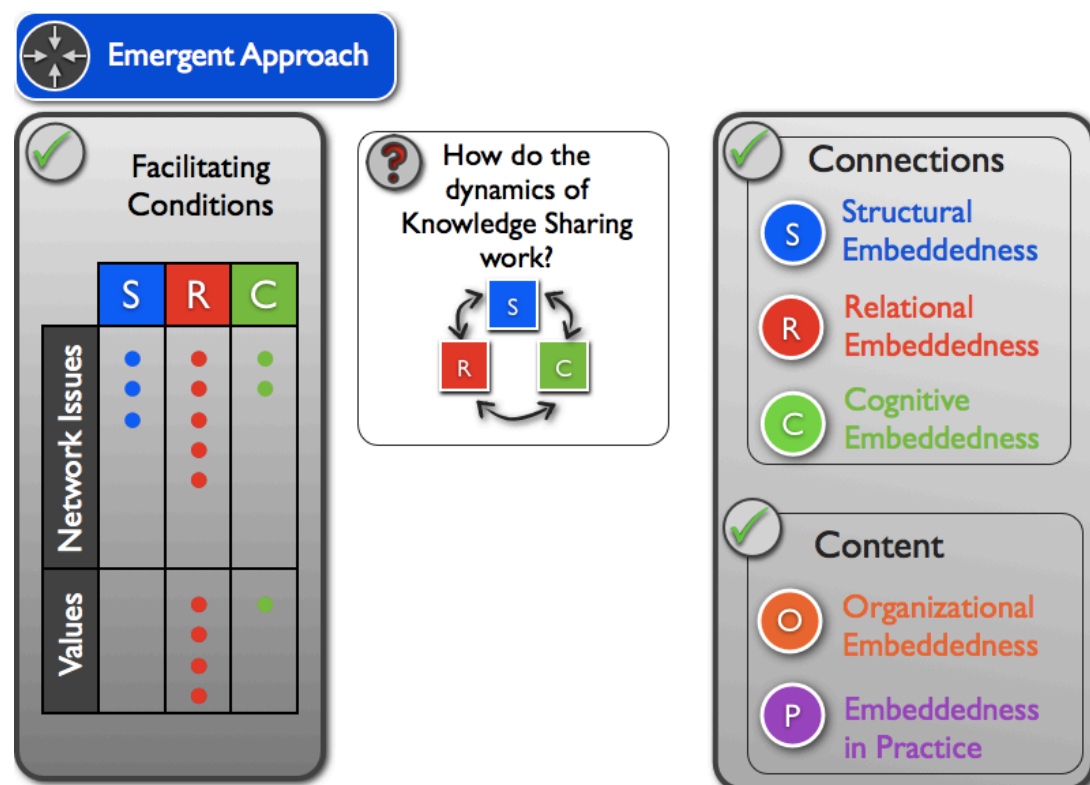


Figure 17: Addressing research question 1



4.3. Chapter conclusion

This chapter focused on the concept of embeddedness. Five forms of embeddedness are discussed that relate to **connections** between network members and the **content** they share with one another.

The embeddedness-measuring framework is developed to analyze the connections and content that occurs in a knowledge network. The framework is implemented in the following chapter as part of the case study of ACC.



5. Case study and analysis

This chapter introduces the case study of ACC. The management of ACC were interested in how efficiently ACC's knowledge network was in enabling members to share knowledge.

To assess the knowledge sharing activities that are present at ACC, interviews that were conducted during 2005 to 2007 are analyzed. The analysis method of the interviews is discussed and insights are gained by implementing the embeddedness-measuring framework.



The exchange to the Vrije University of Amsterdam lead to meeting Ms Agterberg who had conducted a case study at an international chemicals company, referred to as 'A Chemicals Company' or ACC. As part of the case study, interviews were conducted with various role players regarding knowledge sharing in four knowledge sharing communities or networks in ACC.

This presented the author with an opportunity to specifically investigate:

- The dynamics of knowledge sharing in a knowledge network with regard to social capital
- Analyzing the effects of management interventions on knowledge sharing in a knowledge network.

It was decided to use this second hand interview data, whilst frequently consulting with Ms Agterberg to gain additional insights. The reasons for analyzing these interviews, as opposed to conducting personal interviews was as follows:

- The line of questioning and resulting answers from interviewees was focused specifically on knowledge sharing in knowledge networks in a dispersed organization.
- The ACC case study was conducted over a period of 2005 to 2007 allowing for 20 interviews with a lot of detail to analyze.
- The time saved on not interviewing people personally and the quality of the interviews done at ACC resulted in much more in-depth analysis.
- The exposure to a truly globally dispersed company would not be financially feasible as part of a masters degree.

5.1.A Chemical Company

ACC is an international organization producing polypropylene and polyolefin³ products. Raw grains, produced out of oil residues are used for the fabrication of different kinds of plastics for which a diverse range of technologies and production processes are developed within the organization. With plants throughout the world, manufacturing activities in 20 countries and sales activities in more than 120 countries it is a globally dispersed organization. This creates many challenges for ACC's 6700 dispersed employees with regard to sharing knowledge regarding best practices and assisting one another with problem solving.

During 2001 to 2002, 17 online knowledge sharing communities were created to support knowledge sharing throughout the widely dispersed organization.

³ A polyolefin is a polymer produced from a simple olefin (alkene) - <http://en.wikipedia.org/wiki/Polyolefin>



These knowledge networks were organized around specific areas of expertise like HSE (for Health, Safety and Environment issues), Maintenance, Quality Management, Supply Chain, PP (polypropylene), etc.

The networks are e-mail based discussion forums where members can post their messages, reply to messages, send and store documents. Most postings on the networks relate to problems faced at site for which advice from other members is sought. Participation is voluntary and generally informal in nature. Membership is enabled by an online request that is filled in and approved by the specific network's moderator.

Every network has one or two moderators; these moderators are generally high-level management. A moderator's role is to stimulate discussion in the network; keep the network organized and transfer relevant knowledge between networks. In practice though it is not clear what responsibilities the moderators have in the networks. Some moderators were rather invisible and inactive and networks generally showed high moderator turnover making it unclear who the moderators of a network are. Additionally it emerged that in some networks other members took initiative to do some of the moderators' tasks. For example, some members with more experience or time would take responsibility for their networks.

In addition ACC created a steering committee for each network, generally consisting of two formal managers, an IT manager and a knowledge exchange manager. These committees monitor activity in the networks and have quarterly discussions (teleconferences) in which they evaluate activity levels in the previous period.

5.2. Interviews conducted at ACC

ACC was interested in what was happening in their networks, how activity and interaction developed over time and how the social dynamics of members were being affected. Ms Agterberg decided to focus on four networks, thus limiting the scope but enabling much more in-depth analysis. Members were interviewed if they were part of one of the following communities:

- Health, Safety & Environment Community
- Supply Chain Community
- Quality Management Community
- Maintenance Community
- Site Managers Community

The majority of the members of these networks are mid level or operational (site) managers. Regional and global leaders are also active in the networks as well as some lower level employees. During the period 2005 to 2007, 20 interviews were conducted. Refer to Appendix A - Table of Interviewees.

The author thus received 20 transcribed interviews from Ms Agterberg. From this point the analysis, discussion and results are all the work of the author.



The author did have Skype and email interaction with Ms Agterberg as to ensure the accuracy of the insights and conclusions.

Interview analysis software, ATLAS.ti, was used by the author to structure and code the transcribed interviews. Each interview was coded according to the elements of the five forms of embeddedness discussed in Chapter 4.1.1 – 4.1.5. Refer to Appendix B for a short description of ATLAS.ti.

This process assisted in gaining a better understanding into knowledge sharing activities in five networks of practice. Those interviewed were members of communities, amongst others, Supply Chain, Quality Management, Health & Safety Environment and Maintenance. Additionally, it emerged that many of the interviewees referred to the Site Managers Community. References to the Site Manager's Community were so numerous that it allowed sufficient insight into this community as to be able to analyze it as well.

These knowledge sharing networks reveal the various dynamics of knowledge sharing and how management attempted to intervene and the resulting effects.

5.3. Analysis method

The analysis-method employed was coding the interviews according to the forms of embeddedness. As previously stated ATLAS.ti was used. A brief discussion of the coding process is presented, as to demonstrate how the results of the analysis were achieved.

The coding process entails assigning codes according to terms that represent a concept. By assigning these codes, the researcher can tag or mark phrases, sentences or passages of an interview with the relevant code. This enables one to breakdown each interview, thus assisting in structuring the analysis process.

The codes that were assigned in ATLAS.ti were the elements that the forms of embeddedness comprise of. A summary of those elements is presented in Table 5.



Table 5: Codes assigned in ATLAS.ti

Organizational Embeddedness	Institutionalization
	Relevance for Org
Embeddedness in Practice	Common Practices
	Relevance to Practice
Structural Embeddedness	Connectedness
	Know who is where and knows what
Relational Embeddedness	Reciprocity
	Trust
	Openness
	Face-to-Face
	Group Feeling
Cognitive Embeddedness	Shared Technical Language
	Shared Language and Culture
	Shared Business Culture

To illustrate the coding process, extracts from analyzed interviews in ATLAS.ti will be taken and discussed. In so doing the process of how insights are gained is explained.

Example 1

In this passage (Figure 18) Member 11 is answering questions regarding the perceived usefulness of the Knowledge Exchange (KX) network to the organization.

<p>068 Build wider network?</p> <p>069 Yes. And what you also see, ok perhaps in the beginning not a lot because than they are depending on the moderator but later on, they give their opinion and one guy in Europe now knows that his colleague in the US is mr. S. and he knows about it and what you see then is that later on he'll probably call him because he gets a bit of trust in this person. What you normally would not do.</p>	<p>Connectedness~</p> <p>Trust~</p>
--	-------------------------------------

Figure 18: Example 1 of ATLAS.ti extract

Asked whether the network builds a wider (social) network, Member 11 confirms that it does increase a member's social network, and then continues by stating how this in turn increases trust between members.

From this we firstly note how the KX network has increased member's connectedness, and secondly how this has increased trust between members. Furthermore, insight is gained regarding the inter-related nature of



connectedness (structural embeddedness) and trust (relational embeddedness).

Example 2

In this example (Figure 19) a further discussion with Member 11 focuses on when she contacts an individual or goes to the effort of sharing her knowledge on KX. The resulting conversation revolves around reciprocity and how it is related to other aspects of embeddedness.

<p>070 071 So next time contact person directly? 072 Yes... Sometimes yes, but it depends, what I try to do when I've gathered some information for example by phone and I think it will be useful for also other to know, then I post it in KX too. As a kind of summary. But that depends of course on your own opinion. If you think it can be useful for, perhaps some people will say no, not really and of course it also means that it's work for you because you have to think about making a summary and put it in, it's not exactly that you do it for yourself. You just give feedback to your other colleagues, to say well thank you for your answer and we have done this and this and this.</p> <p>073 074 Why take effort to do that? 075 I think because you expect that when you also give them some feedback they will help you more easily the next time. So you build a sort of virtual trust in people even if you don't know them. So people say we had the same issue a few years ago then people said yes ok but I do not know who can read it all. To be honest I don't care. If it are colleagues and you post something that could be useful what they do with it is their problem. Within a certain confidentiality of course, you can't put it out somewhere in the internet. Just to have a kind of approach I help you, you help me, perhaps the next time somebody else will help me again. Because if you help people several times and you don't get the feeling that it's willing you stop doing that.</p>	<p>Reciprocity~</p> <p>Relevance for Organization~</p> <p>Reciprocity~</p> <p>Trust~</p> <p>Common practices~</p> <p>Reciprocity~</p>
--	---

Figure 19: Example 2 of ATLAS.ti extract

Thus the coding assists in:

- Isolating aspects of embeddedness that are important or are an issue and require attention.
- It disentangles the intertwined aspects of embeddedness that are present during the knowledge sharing process.

From this one can gain insight into how members are motivated or demotivated to share knowledge. Additionally, it enables one to advise management as to what interventions are required.

To assist the reader in gaining a better understanding of the analysis process a visual aid is implemented in this chapter. When aspects regarding any of



the forms of embeddedness are mentioned the specific form will be indicated in the left hand margin according to the colour scheme (Figure 20).

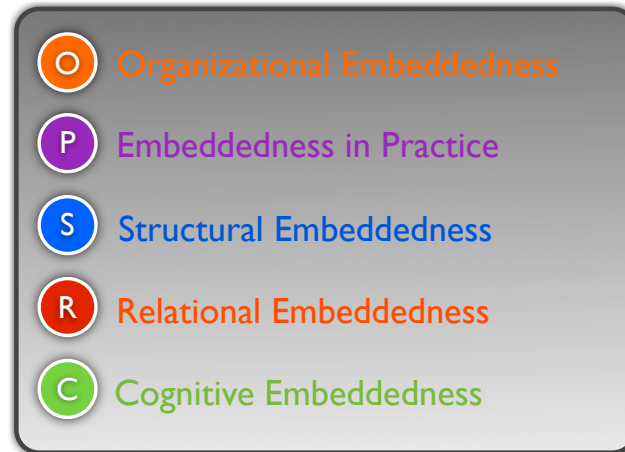


Figure 20: Graphic representation of each form of embeddedness

Moreover, when there is evidence of the dynamic interaction of forms of embeddedness it will be depicted as described and illustrated next:

Reinforcing interaction between forms of embeddedness will be illustrated with **green** arrows:

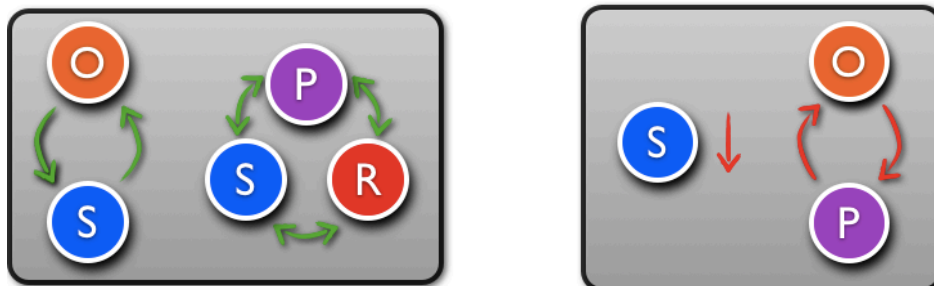


Figure 21: Illustration of reinforcing and weakening interaction of forms of embeddedness

Weakening effects on a form of embeddedness or the **weakening** interaction between forms of embeddedness will be illustrated with **red** arrows.

5.4. Measuring the dynamics of knowledge sharing

“A community thrives if the exchange (of knowledge) is valuable.”

Site Manager 4, UK

This seems to be a self-evident statement, but there are many aspects that affect the value of knowledge shared. The best motivator for people is if their sharing of knowledge directly leads to solving problems on a daily basis. For management the value of knowledge is in establishing best practices on an organization-wide basis and having those practices institutionalized.



The quality of knowledge exchanged has increased since the inception of the KX communities during 2001 to 2002. This is according to the Maintenance Community moderator (interviewed in 2005). The emphasis is now on quality, not quantity of knowledge sharing, as this has much more value for ACC. It is also the increasing quality of knowledge shared that has enabled KX to become an accepted tool.

“What we see from the activity level, we are a little bit below the activity level of last year but I think the whole impression is its quality increased. It’s more efficient. Now we are, there is a problem with a situation that we increased the level, decreased a little bit on the activity level, but some people want to try to turn the screw at both ends. Increase quality and the number of contributions. This is I think not realistic. So I think we are now on the good way to use this as an accepted tool for good quality knowledge exchange. Now we are on the point that we shouldn’t count every contribution.”

Maintenance Moderator

For management there are numerous challenges, most importantly justifying the time and resources spent on KX. It is evident in the following quote:

“I think it is a good tool for exchanging knowledge, also to protect knowledge and to store knowledge. But I can’t evaluate the benefit of this. I can’t say, and this is what we very often see on our KX meetings, what is the real benefit?”

Maintenance Moderator

This is a crucial question that must be addressed. One cannot attempt to evaluate the benefit of shared knowledge on an accounting basis, i.e. there is no bottom-line amount that can be calculated for the value of knowledge shared. The challenge with addressing these issues is directly related to the abstract and tacit nature of knowledge.

The following chapters are dedicated to the following communities and the implementation of the embeddedness-measuring framework.

- 5.4.1 HSE Community
- 5.4.2 Site Managers Community
- 5.4.3 Maintenance Community
- 5.4.4 Supply Chain Community
- 5.4.5 Quality Management Community



5.4.1. HSE Community

Many members view the Health, Safety and Environment (HSE) community as very active, effective and valuable.

"We are very proud in ACC on our HSE performance and KX helps to contribute to the success. HSE is to me the most valuable community as it is the most common issues community to us."

Site Manager 1, Australia

"The HSE really stands out, there is a lot of synergy of safety across the organization. So you can relate to issues quite easily. HSE is at the heart of our organization. I like to see what is happening and it also leads to local discussions... HSE is also well moderated, it is a focused area, people work on it, they work together, and they meet... We can just very often directly apply what you read on KX in your local setting."

Site Manager 4, UK

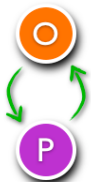
It has a strong emergent community, with little need from moderators to stimulate discussion.

"What I have noticed in other forums that sometimes there is a moderator who is deliberately stimulating discussion. In HSE there is a global team, dispersed around the world that can look at individual site performances and prompt sites to describe their experiences on KX."

Site Manager 1, Australia



The activities of HSE are mostly related to accidents in the work place. It is very important to have an incident/accident free work place for ACC. In the case of an accident, it is meticulously investigated and a report detailing the event and recommendations is compiled. The explicit form of the reports, enable straightforward sharing in the community. The consequent discussions are well guided and specific to the point of each incident. Thus, there is a high level of relevance to the organization, with the processes being well **institutionalized**.



The incident/accident reports have a lot of **relevance to practice** and **common practices** are highly valued in the organization (**relevance for organization**). The recommended changes have to be applied organization wide (**institutionalized**) to prevent similar incidents/accidents. The much quoted success of this network is because of a strong reinforcing dynamic due to the inter-related nature of organizational embeddedness and embeddedness in practice.

Another reason for its success is the explicit nature of the knowledge shared and the strong emergent culture. As the next quote points out:



“A community thrives if the exchange is valuable. You can’t force them to work, maybe for two months but then it just has to go on its own.”

Site Manager 4, UK

The sharing of reports and resulting discussions are lead by experts, with little need for the moderator to promote sharing. The high activity levels of experts are testament of the community’s high levels of social capital.

“I think you only have a few communities (HSE is mentioned in this context) that can live without an active moderator. Because normally the core (experts) is taking that over, so they are doing the moderation.”

Member 11



The community is well **connected** with members able to find the relevant people with the relevant knowledge. The numerous experts active in the community would explain these high levels of **connectedness** that they have built up from years of experience in the organization.



The success of the network is also testament to high levels of **trust**, **openness** and **reciprocity**, as the next quote illustrates:

“I think because you expect that when you also give them some feedback they will help you more easily the next time. So you build a sort of virtual trust in people even if you don’t know them... I help you, you help me, and perhaps the next time somebody else will help me again.”

Member 11

The reinforcing dynamic is clearly present; with increased relational embeddedness members are increasingly motivated to share knowledge.



With regard to cognitive embeddedness the following quote is evidence of the value of a **shared technical language**. The strong **institutionalization** present in the network has enabled a shared technical language in the organization, which has made sharing relatively easier.



“Because it is always when you do written communication if it’s not very clear, people can interpret it in a different way... Technical problems are most straightforward. So there the chances of miscommunications are less.”

Member 1

Management have supported the HSE Community in the following aspects.



5.4.1.1. Interventions in the HSE Community

The fact that Health and Safety is an integral part of ACC's operations means that many resources are allocated for this community. The following excerpt highlights this fact:

"Well maintenance did not have so much resource focus as it should have, like HSE got. We get a bonus based on our profit, the cash flow and on HSE. So that is an incentive to focus on HSE."

Site Manager 1, Australia



Many resources have been made available to deal with issues regarding HSE. This coupled with a financial rewards mechanism that rewards minimizing accidents, has had a positive effect on emphasizing the relevance of knowledge shared (**relevance for organization**). In turn, this has resulted in much attention being focused on institutionalizing local best practices on an organization wide basis. Thus **organizational embeddedness** is well supported by management. The success of the HSE Community justifies the resources allocated to it as there are tangible results. Yet, in relation to the bigger picture, as more resources are allocated to the HSE Community, other communities receive less.

The thriving community has lead to little or no need to 'force' sharing. The reason for this is coupled with the importance of zero accidents, resulting in many experts adding value by sharing knowledge. This makes the role of a moderator much easier: i.e. the moderator need not spend much time on motivating and encouraging daily activity because of the community's emergent nature with many experts sharing. The high levels of **structural**, **relational** and **cognitive embeddedness** assist in this regard.



The success of the HSE Community is a direct result of management's implementation of KX's ICT infrastructure. KX has increased **connectedness** of members, and additionally, members' knowledge of **who is where and knows what**. There are no signs of users' needs that have changed in the HSE Community, thus current ICT tools are sufficient. It is important though that the ICT infrastructure is kept up-to-date. Management's intervention with regard to the implementation of ICT has positively influenced knowledge sharing.

To assess if management supports the community well, one can now refer back to the value related issues management have to address according to the facilitation conditions of a knowledge network framework (Table 4, page 32).

A strong knowledge culture exists in the HSE Community, whilst members value the knowledge shared. There is a clear institutionalized process in place to document and disseminate changes organization wide, thus, the



communication of knowledge transfer is well supported. Management supports the community well with sufficient resources as Health and Safety issues play an integral part of the business. The extrinsic incentive scheme in place is a big motivator for employees to be active in the community. Refer to Table 6 for a summary.

Table 6: Value related issues in HSE Community

Value related issues	
<input checked="" type="checkbox"/>	Knowledge Culture
<input checked="" type="checkbox"/>	Value of knowledge creation/transfer by itself
<input checked="" type="checkbox"/>	Communication of knowledge transfer
<input checked="" type="checkbox"/>	Time and Resources
<input checked="" type="checkbox"/>	Extrinsic Motivation and Incentives
	Appraisal
	Training and Education
	Personal market value of employees

The resulting conclusion drawn from the analysis is that no intervention is required in the HSE Community, because management sufficiently supports it.

5.4.2. Site Managers Community

The Site Managers Community has experienced very low levels of activity. Upon initial investigation this seems to be disappointing, further analysis into the low levels of knowledge sharing lead to the following insights.

Firstly, a site manager's job entails interacting with all other departments; this directly corresponds with much of their network activity being in other communities. The following quotes are evidence of this:

"The site manager's responsibility also is to promote activities in the other communities."

Vice President of Manufacturing, North America

"If something goes wrong I first turn to my internal experience, so my background and that of my team. Then there is KX. That is important to solve problem or improve strategies and the like. Especially HSE. Or I have direct contact with people at other sites, to tackle new technical issues. We had a lot of problems during the whole change process. So we



mixed internal problem solving with a mix of KX and our internal network within ACC. It works very well to call someone directly. So yeah in first place I try to call someone. I'll tend to call people with either the same technology... Or I call other who I have met."

Site Manager 1, Australia



Therefore, much of the site managers' activities are related to the local issues of the departments they manage. They utilize their well-established **structural social capital** (built up from years of work experience in the organization) to connect with the relevant people that assist them in solving problems. This is evident in their network activity in various other networks.

Another aspect that is not apparent in the Site Managers Community, but that came to the fore with all site managers interviewed, is their high level of **cognitive** and **relational embeddedness**.



The role of site manager requires the relevant skills of understanding the cultural dynamics present in the country that the site is situated. The experience required for being a good site manager means that their knowledge of **technical language** is very good. Their actions are also very much inline with the **organizational culture**. These high levels of cognitive embeddedness extend to the level where site managers easily interact with one another. Additionally all site managers are competent English speakers as it is the accepted **organizational language**.



Site managers generally exhibit an **openness** to share knowledge, whilst mutual **reciprocity** and **trust** exists because of years of interacting and working with one another in some capacity. It is assumed that this is because of their shared goals and objectives as site managers and their possible previous collaboration and interaction with one another in other roles in ACC.



There are some discrepancies though concerning sharing a **group feeling** and the frequency of **face-to-face** meetings. North American site managers meet on a monthly basis, much more frequently than their European counterparts who might meet **face-to-face** only once every two years.

"I used to work in North America and there the site managers had a lot of contact, we meet and called but now I am for two years in Europe here we hardly speak to each other. "

Site Manager 4, UK



This results in a stronger **group feeling**, relative to site managers in Europe. Accordingly US site managers feel less isolated, since they are better **connected** with one another.



In North America high levels of **relational** and **structural embeddedness** are not necessarily resulting in better forms of **institutionalization** though. Whilst the value of shared knowledge to the organization (**relevance for organization**) is questioned.



Site managers share knowledge locally (their own site) or in other networks of practice (HSE, Quality Management, Supply Chain etc.), they do this very effectively. They do face challenges sharing **best/common practices** with other site managers, because of the unique nature of local problems encountered.

“I am very willing to help him (a site manager) solve his problems. But I don’t see the value of posting my solution to a problem on KX because that problem was unique, not relevant for others.”

Site Manager 5, Argentina

“Site managers are in conflicting pressures and we tend to accept the current paradigm, being not willing to find best practices on KX.”

Site Manager 1, Australia

A related issue is regarding the value of knowledge shared between site managers:

“The business benefit (of knowledge shared between site managers) is hard to measure. I am not convinced that I can apply other site management things to my daily work. We tend to use the information on KX but not on the Site Managers Community... the subtleties are different, it takes a long time to explain your problem and the context.”

Site Manager 4, UK



The fact that the UK Site Manager questions the ‘business benefit’ of knowledge shared in the Site Managers Community shows that the **relevance for organization** of knowledge shared is doubted. Couple this with **common practices** that are unique and difficult to share and it results in **organizational embeddedness** and **embeddedness in practice** being negatively affected.

With more frequent **face-to-face** contact and a resulting stronger **group feeling**, the US community’s level of **relational embeddedness** is higher. Yet as has been noted this has not meant a perceived increase in **embeddedness in practice** or **organizational embeddedness**. The following comment sheds light on this issue:

“I must say that not all discussions we had in North America, well it did not change the business or something; it is hard to say what the real added value is. But at least we felt close; we felt we were part of a tight group. In Europe I don’t feel I am lacking that. I do lack a bit of an overview of what is happening at other sites. But maybe the European way is a bit more efficient I don’t know it is hard to measure the added value of such informal contacts. But maybe in Europe we are a bit too focused on our own site.”



Being a site manager is a lonely job so feeling a bit more connected might be good thing. Here you are on your own."

Site Manager, 4 UK

It is interesting to note that the EU community is seen as being "a bit more efficient". Possibly because site managers are more focused on their own sites, but this again has a negative affect on [connectedness](#). This is contrary to what is expected with EU Site Managers not engaging much with other site managers, not sharing [common practices](#). It casts much doubt over the benefit of the US Site Mangers frequent meetings.

Next we will discuss interventions by management that have been attempted

5.4.2.1. Interventions in the Site Managers Community

It is clear that the lack of activity in the Site Managers Community does not mean that site managers do not share knowledge. What was observed was that the specific role of a Site Manager demands activity in other communities and sharing knowledge on a local level, to solve local issues.

"There are two sites in Australia and there is a corporate manager who is responsible for the plants, he has a lot of contact. A number of my team members are on KX. You get to see what is going on in KX. I ask my team mates for example: Did you see that post on KX? What did you do? Did you respond? But we are mainly active on the HSE and PP community."

Site Manager 1, Australia

There is sufficient ICT support for site managers to interact with the many groups, departments and communities that affect their work:

"So there is e-mail exchange, face-to-face meetings, workshops and seminars. So there is a good network of collaboration between site managers and you know that's perhaps why you know the actual KX stream is a little weak... because site managers might feel right now that what you (management) has in place suits their needs."

Vice President of Manufacturing, North America



Thus, with a "good network of collaboration", there is no need for site managers to be active in the Site Managers Community. [Common practice](#) issues are shared in other communities or by other means, i.e. the meetings, e-mail, workshops and seminars. Similarly [relevance to practice](#) is not related to the site mangers community, as they are active in others.

There is a need regarding discussions that affect site managers but are not dealt with in other communities. The following quote is a good example:

"There was a discussion on HR issues, like finding and comparing a common structure for job descriptions. How do we organize ourselves? That is an issue not dealt with in other communities... But if I have issues






with people or trade unions or such, I don't go to KX, that's too specific to my situation. It could be a missed opportunity though; maybe someone has dealt with it in a similar situation."

Site Manager 4, UK

As this example shows there are occasions when issues arise that require discussion between site managers that are not covered by other communities.

Thus, in summary, the Site Managers Community is a community with unique complexities. The forms of embeddedness frequently interact. It has a unique group of members who are mostly active in other communities and Site Managers understand the value of the creation and sharing of knowledge. Moreover, there are no problems with the knowledge culture, there is a disconnection regarding how Site Managers communicate their unique local problems to others. The community is not the place to share this knowledge; face-to-face interaction is a better form of interaction. Due to this, other aspects of management intervention are irrelevant. Refer to Table 7 for a summary.

Table 7: Value related issues in Site Managers Community

Value related issues	
	Knowledge Culture
	Value of knowledge creation/transfer by itself
	Communication of knowledge transfer
n/a	Time and Resources
n/a	Extrinsic Motivation and Incentives
n/a	Appraisal
n/a	Training and Education
n/a	Personal market value of employees
n/a	Management

Does this mean there is no need for the community? Does it contribute value to the organization? These are important questions, but cannot be answered in isolation of the Site Managers Community, because site managers are active in other communities. Although the current value of the community is disputed, closing it will not necessarily be a good decision. It was noted that there are issues that concern site managers that are not relevant to other existing communities.

We continue to assess the other communities, and once we have a better view of all the communities, then we can assess the bigger picture.



5.4.3. Maintenance Community



The Maintenance Community adds value to the organization (**relevance for organization**) according to its moderator. When asked whether the Maintenance Community helps knowledge exchange within ACC? The response was very approving:

"I don't waste any time and effort in reinventing wheels. So for that reason I think we should use the KX forum."

Member 5

"I'm a moderator of a KX community. As you can imagine I think this is a most important tool, we offer here in ACC. I can't imagine living without it."

Maintenance Moderator

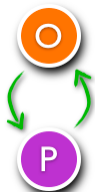
It is noteworthy to comment on the 'buy-in' factor that is essential for members to value and engage in a community. Moderators are 'sold' per se on the concept of sharing knowledge through the KX, and it is essential that they convey this culture of sharing throughout the members in their community.



Evidence that some employees in maintenance are not aware of the value of sharing via the Maintenance Community is evident in the following response from the moderator. Thus it is not part of their daily activities, resulting in a negative effect on **relevance to practice**.

"I think a lot of them forget this in their daily work. If you say oh we can make a contribution in KX they remember there is a tool called KX, they don't know exactly how to work this."

Maintenance Moderator



It appears that **relevance to practice** and **relevance for organization** are intrinsically linked. If employees experience how the KX assists in solving day-to-day problems, the value of it to the organization becomes self-evident, galvanizing members to increasingly engage and share their knowledge. Yet the opposite is also true, if members are not engaged in the community and experience the added value, they will not experience the ability to solve daily problems.



With regards to attempted forms of **institutionalization**, a remark by the maintenance moderator sheds light on a specific form of institutionalization. This remark was made in the context of an annual moderators meeting so it relates to all other communities as well.

The issue pertains to: when a discussion on a specific topic or problem has essentially ended. If for instance the problem has been solved and no more questions are asked.



An unresolved discussion commenced during this annual moderator meeting concerning whether a summary of a specific topic should be written: i.e. summarizing the results of the discussion, which in turn, will assist members to understand the gist of a discussion, whilst searching through archives when confronted with a similar or related problem.



The moderator's main issue with the summary is that it takes too much time. Knowledgeable people with years of experience that are generally in a relatively high management position typically fulfill the moderator's role. Thus with many responsibilities other than moderation, time is a critical resource. Additionally, there are issues regarding who should write these summaries and in what style they should be written. With this issue unresolved it is a good example of a failed attempt of **institutionalization** in the network.



Concerning **common practices**, there is success, but the success must be put into context. It must be pointed out how the dynamics of knowledge sharing interact to allow for meaningful interaction and exchange between people.



The success regarding establishing **common practices** via the Maintenance Community is framed in a question that was asked to the maintenance moderator. Asked whether KX assists in growing a wider social network for members, the moderator sheds light on how **face-to-face** meetings assist in growing a wider social network (**connections**) whilst assisting in highlighting **common practices**:

"Once a year when we have a maintenance workshop meeting outside Wesseling maintenance colleagues especially from European sites like Munster, Moerdijk and Pernis get together. This I think took place the third time last October. There you can see growth in individual networks. You have presentations, especially to problems or on good or best practices, often in the evening there is some social event and there is the networking. You ask them exactly...also if you drink some beers and say, "How did you solve these problems? I know you are running the same process like we do." So that's a really good exchange."

Maintenance Moderator

The challenge is to extend the value gained from solving problems via the community. It is essential that the value that the moderator and active members get from the community be extended to all other members who are less/not active in the community.



When asked if there were interpretation problems (**technical language**) in the Maintenance Community the answer was a definite 'yes'.

"Yes, there is also a problem. Especially in some processes, if there are problems with extruders or with compressors and it is related to some process... everyone knows that P1 is the feed pump, for example. But for a person who is not familiar with this process... you can't give any support."



So this is especially an issue in the, let's say process related questions. Which are also sometimes maintenance aspects, a little bit problematic."

Maintenance Moderator



Additionally there exists a **language** barrier that makes it very difficult for members whose first language is not English to request assistance or post a problem on the maintenance network.

"I think there is sometimes a language barrier, it could be a problem, it is much easier to call your colleague in your own language, instead of writing a knowledge request in English."

Maintenance Moderator

It is evident that there are issues at hand in the Maintenance Community that need to be addressed. We now turn to what interventions management attempted.

5.4.3.1. Interventions in the Maintenance Community

Management has the difficult task of maximizing knowledge shared with limited resources. It is a fine balancing act. The fact that the HSE Community has many resources and is an integral part of the organization's operations, results in the other communities receiving a lesser share of the limited resources available.

"Well maintenance did not have so much resource focus as it should have, like HSE got. We get a bonus based on our profit, the cash flow and on HSE. So that is an incentive to focus on HSE (as opposed to Maintenance)."

Site Manager 1, Australia



There exists a disparity between what management expects of moderators and the reality that moderators are faced with. The Maintenance Moderator highlights the fact that management's expectations versus reality are amiss.

"We had a not so easy discussion with Tammy on Tarragona and in her impression we should take between 25% and 50% of our time for KX. But I am a head of a department here; I have all craftsmen, supervisors, engineer and a workshop. In my role it is not possible to do this. This was also the opinion of other colleagues working as KX moderators. It is an additional, special job, additional work like being a member of a workgroup or something. But it is not possible to spend a week 10, 15 or 20 hours. To be honest I spend between 2-5 hours a week depending on the amount of contribution. If there is for example steering committee conference, so this is 1.5 hour for phone calls. Some contributions by me, contacting some colleagues, go for a meeting once a year or once a half-year."



Maintenance Moderator

This issue is relevant to all moderators, but also many members mention this issue. Employees who are moderators have to manage their time very effectively, with the moderator role adding to their already big workload. Unrealistic expectations from management have a negative effect on moderator's and member's motivation to share knowledge.

What is motivating is that the perceived quality of knowledge shared has increased as the maintenance network (this is presumably the case for most of the networks) has matured.

"What we see from the activity level, we are a little bit below the activity level of last year but I think the whole impression is its quality increased. I remember the first time I worked as a KX moderator, and I don't know my request put in the KX, but the answer: "Oh I'm sorry we can't help, wish you a good year." So this dropped. We don't find these kinds of contributions anymore. Responses are real responses, not only to count a contribution. If someone can't help he gives no contribution."

Maintenance Moderator

It is important to mention the shift in focus from quantity to quality as well. One can imagine that initial concerns with the inception of the networks were just to get members to contribute and adopt the communities. Appraisal focused on activity levels and volume of contributions. Yet, as is mentioned in the previous and following quotes, members are using the KX communities more efficiently now, by being more to the point.

"So it's more efficient. Now, there is a problem with a situation that we increased the level, decreased a little bit on the activity level, but some people want to try to turn the screw at both ends. Increase quality and the number of contributions. This is I think not realistic. So I think we are now on the good way to use this as an accepted tool for good quality knowledge exchange."

Maintenance Moderator

Therefore as a network matures the methods of appraisal have to change accordingly. Whether appraisal systems are able to measure quality as opposed to quantity, is a challenge in itself. It does not fall in the scope of the research to address this issue.

To summarize, there exists a healthy knowledge culture in the Maintenance Community, but not all employees that work in Maintenance are aware of the value that knowledge sharing brings. Unresolved issues regarding institutionalization remain, with challenges regarding time management being a major component of this. The community receives far less resource focus compared to the HSE Community, thus affecting member's motivation to



share. Methods of appraisal are not sufficient to measure quality of knowledge shared. These issues are summarized in Table 8.

Table 8: Value related issues in Maintenance Community

Value related issues	
	Knowledge Culture
	Value of knowledge creation/transfer by itself
	Communication of knowledge transfer
	Time and Resources
n/a	Extrinsic Motivation and Incentives
	Appraisal
n/a	Training and Education
n/a	Personal market value of employees
n/a	Management

5.4.4. Supply Chain Community



There is a definite belief that the Supply Chain Community has added value to the organization (**relevance for organization**) according to one of its members.

“So KX helps solve problems and save time and money.”

Member 8



The knowledge shared is addressing a very specific issue for this member. It relates very much to solving problems (**relevance to practice**) and the role that the community plays in the process. When confronted with a problem, the first step would be to contact someone internally, an expert or more experienced employee locally (on site). If no-one can help solve the problem locally, the next step would be to contact someone the member knows from previous interaction that is not locally situated, but would have experience with similar problems. If this search for a problem solver turns up no results, the next logical step is to post the problem on the KX community. Thus extending the reach of possible problem solvers to all related members who could possibly assist and are part of the community. See Figure 22 for a graphical illustration of this process.

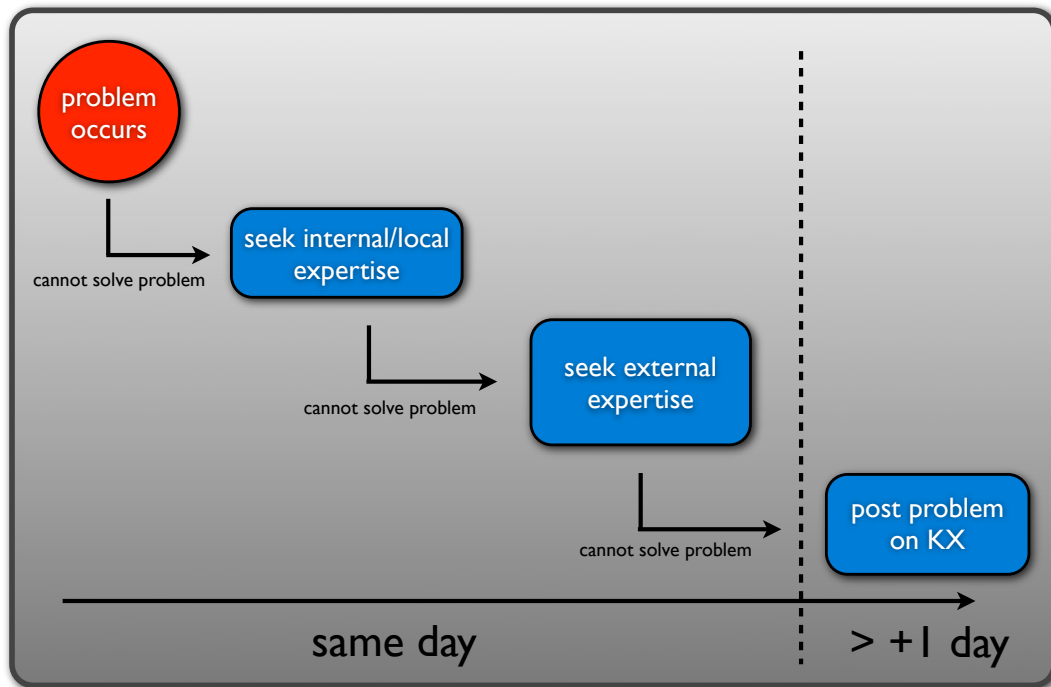


Figure 22: Problem solving process

It is noteworthy to mention that there is a general rule, especially with problems that need urgent attention. Typically, posting a problem on a KX community has a turn-around period of one day or more. It has reduced the turn-around time for solving these types of issues. So, in summary, if a problem is urgent i.e. needs immediate attention, it is quicker to contact someone locally and then external experts. If it is less urgent, the KX community is consulted.

“For my daily work, it is difficult to say, because a problem can occur and you can put it in (post of KX), but don’t expect that you will get a reply from KX the same day. So it is for the longer term, because it is not for ad hoc business (problem solving).”

Member 8

This does not mean that the KX is seen as a last resort option or only used when all other options have been exhausted. To the contrary, before the KX existed, if a problem was not solved by means of local or external experts it could typically take much longer to solve (many days). The KX is essentially extending member’s ‘[know who is where and knows what](#)’ ability.

“The advantage of KX is that you drop a problem and it comes directly to the people who have the same interest and knowledge who can help you further. Without KX a need to go to look for, “OK which person within ACC do I need to contact?” So there will be a lot of delay I think (without KX).”

Member 8



"Therefore the community is very good to at least get a chance to get the opinions from other sites. It is not that you always get an opinion but at least you get the opportunity to do so."

Member 11



The additional advantage of the KX is that once a problem is solved via someone replying on a post on the KX, all members related in the post on KX extend their **connectedness**. The process of problem solving via KX is extending member's networks, whilst at the same time increasing people's **trust**.

"...they give their opinion and one guy in Europe now knows that his colleague in the US is Mr X. and he knows about it and what you see then is that later on he'll probably call him because he gets a bit of trust in this person. What you normally would not do."

Member 11

A fascinating insight is gained from the follow-up question and resulting answer from the above quoted statement. When asked whether the quoted member will contact 'Mr X' in future, the interviewee responds as follows:

"Yes... Sometimes yes, but it depends, what I try to do when I've gathered some information for example by phone and I think it will be useful for also other to know, then I post it in KX too. As a kind of summary. But that depends of course on your own opinion. If you think it can be useful for, perhaps some people will say: "No, not really". Of course it also means that it's work for you, because you have to think about making a summary and put it in, it's not exactly that you do it for yourself. You just give feedback to your other colleagues, to say well thank you for your answer and we have done this and this."

Member 11

This sheds more light on the intricate dynamics of knowledge sharing between people. One could ask what motivates a person to be selfless and share knowledge with the group, as opposed to just the intended person. It is possibly related to the knowledge sharing experience of a person. This is only open to hypotheses, but could explain and demonstrate the self-reinforcing dynamics at work in a knowledge network. It is worth exploring the concept for a moment.



If a member experiences positive, negative or zero feedback it will have an effect on:

- **Trusting** other members to share more in future
- Being increasingly **open** to sharing his or her own knowledge in the future



The experiences of other members replying or not will also influence a person's **openness** to **reciprocity**. If reciprocity is returned it reinforces trust and openness, but the contrary is also true. If a person continually shares without anyone returning the favour, it is a great de-motivator. This is expressed by one of the members as follows:

"I think because you expect that when you also give them some feedback they will help you more easily the next time. So you build a sort of virtual trust in people even if you don't know them... To be honest I don't care. If it is colleagues and you post something that could be useful, what they do with it is their problem. Just to have a kind of approach I help you, you help me, perhaps the next time somebody else will help me again. Because if you help people several times and you don't get the feeling that it's willing you stop doing that."

Member 11

As with all other communities there have been external factors at play within the network. Next we look at what it has meant for knowledge sharing in the community.

5.4.4.1. Interventions in the Supply Chain Community



Due to merging with another company, organizational changes have had a negative effect on employees **trust**. With mergers come employee reductions and this also negatively affects trust in the organization. Asked whether these organizational changes influenced knowledge sharing, the interviewee had the following answer:

"Yes, because if you change too much people focus on other things and have other priorities. They loose their motivation; they loose their trust in the company. This time it will be Brussels, last year it was Mainz, next year it will be whatever. Some people will loose their jobs or have to move. This year, next year or the year thereafter you can be the one. So I guess the loosing of trust in the company, could be a disadvantage. Because if the company doesn't see you as a useful person, as an expert or as somebody with knowledge why should you give the company your knowledge?"

Member 11

Consequently, management must be aware that employee's sense of job security influences their motivation to share knowledge. Trust in the organization rather than trust between members can be affected, with members consolidating their knowledge in the belief that they lose market value the more they share: i.e. they lose their value if they share too much of what they know, thus making them replaceable.

Management must be equally aware that the work of a department and its employees' jobs play a major role in determining if they will use the KX. The example of the Sales and Marketing department is mentioned. According to



the interviewee this department does not see the value of Supply Chain Community to them.

"I come from Sales and Marketing, it has a typical commercial approach. They know what they're talking about and they have their own customers and they don't have the same problems, because there are all specific ones, and they are taking care of their own thing. So they don't feel related to what is discussed in communities."

Member 11

Even though some of the knowledge shared in the community is related to their work, much of the content shared has no relation to their work. The resulting effect has been that most of the department's employees have all but shunned the KX. Many employees are not even aware of the KX's existence.

"If you ask around here, in this building, in the sales marketing area, if they know what KX is, they probably say: 'Huh?' So it depends on what kind of experience people have, in former jobs, and in what community, what department, in what job you are now and how you use it."

Member 11

The issue is that too much content is generated for a moderator to decide what content is relevant for whom.

"Sometimes it should be more specific, for more specific groups. So even within supply chain for example, or in quality community sometimes the groups are too general and therefore people see a lot of things they don't like to see. Even think that the daily mails they receive with the posting are very annoying, and just delete them. And that makes no sense of course."

Member 4

So, ICT intervention is required that will allow members to refine their interests for a specific community, thus receiving more specific content. This will require that KX's functional ability be upgraded.

To sum up, the Supply Chain Community has added value by enabling members to solve problems by sharing common practices. Turn-around time for solving problems decreased substantially. This has strengthened the knowledge culture, and members appreciate the value of sharing knowledge. There are issues concerning the Sales and Marketing department's inactivity in the community, much of the community's activity does not interest them, although there are issues that do relate to them. Thus communication of relevant issues concerning the Sales and Marketing department is necessary. As with other communities, knowledge sharing is a time consuming activity, with many members complaining that they do not have time for it in their already overloaded workday. Due to a merger, changes in the organizational structures, coupled with employee's job security decreasing have decreased



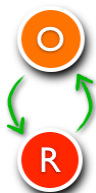
trust in the community and as a result knowledge sharing has decreased. This is summarized in Table 9.

Table 9: Value related issues in Supply Chain Community

Value related issues	
	Knowledge Culture
	Value of knowledge creation/transfer by itself
	Communication of knowledge transfer
	Time and Resources
n/a	Extrinsic Motivation and Incentives
n/a	Appraisal
n/a	Training and Education
	Personal market value of employees
	Management

Once again we can see there are many complex issues at hand that require attention. There are many variables in a complex and dynamic system. The relevant question is, which issues are more pertinent and which are negligible? Deciding on these issues is not a simple process.

5.4.5. Quality Management Community



It is a noteworthy observation that apart from the HSE Community, no other community had examples of successful forms of **institutionalization**. The Quality Management (QM) moderator sheds light on this issue. According to the QM moderator many of the activities relating to **institutionalization** are occurring during **face-to-face** meetings.

"I think a lot of knowledge is exchanged by our meeting structure. This is maybe quite complex. There are many meetings in which you have people from all the disciplines at one table (people from the plant, product development and from the business units). You really have an exchange of ideas, of strategies, what you do, regarding information."

Quality Management Moderator

The nature of the knowledge being shared during meetings is seen as 'complex', thus requiring face-to-face meetings to handle it. There has also been no need to change this as it has always been handled this way.

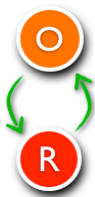
Additionally, the QM moderator will contact someone directly when dealing with issues regarding the discussion of strategy, company politics and decisions regarding upper management



"If I think it's very special. Or if I know that it's not a problem of everyday work but if you have, if it's more in the direction strategy, politics and if I know that normally upper management is making decisions."

Quality Management Moderator

The distinction is made regarding 'special' issues and everyday problems. The emphasis on 'special' refers to issues that are simply too difficult to word in an email/post whilst also requiring real-time input (meetings) with specific people, not the whole community.



The fact that issues regarding "direction strategy, politics and upper management decisions" are addressed via **face-to-face** meetings emphasizes the importance of people meeting in person to address these issues. Furthermore, the lack of **institutionalization** via the KX communities sheds light on which knowledge sharing activities the KX community cannot address. The HSE Community shows that **institutionalization** is possible through the KX, but it was stressed that the explicit nature of the reports simplified the process.

When asked how useful the KX communities are to the organization the moderator replies:

"It could be of much more benefit if it would be used more. Because there are always the real big issues nobody puts in. For example, sometimes people just fight with things without thinking that others might have the same problems."

Quality Management Community Moderator



Thus, a dynamic relationship exists between **relevance to the organization** and **common practices**. These forms of embeddedness will strengthen one another, but at present it is not optimal. Members need to experience the value adding qualities of the community.

There seems to be reluctance from many members to share problems they encounter. This is possibly related to people not being **open** or reluctant to admitting their inability to solve an issue.

"Sometimes people have problems and I think it takes a long time until they really dare to ask questions. Sometimes they are shy or they do not want to tell everybody that they have a problem and not know the answer yet."

Quality Management Community Moderator

A fascinating revelation from a QM member adds an additional dimension to member's reluctance to use the KX. According to this member the fact that the QM Moderator uses her 'Dr' title negatively affects member's willingness to share. This causes some members to feel that their contributions might not be of 'university knowledge level', i.e. inferior. Although these revelations are



made during a workshop, it is safe to assume that this will cause members to be reluctant to engage in problem solving issues in the KX community as well. In essence negatively affecting their **openness** to share knowledge

“Our moderator uses her Dr title. And during the workshops people said to me that they saw her name or her role as Dr Quality Manager Europe as a barrier to say something there. Because they think it should be of university knowledge level and not something they think about something. And I have experienced the same thing in my own role, if people hear about the corporate quality department; they think you’re a big manager with a suit and a big car.”

Member 4



According to the moderator, KX assists new employees to build a **wider network**. They receive training in the use of KX and are added to relevant communities. Subsequently as they start reading through posts in their communities they learn the contributors’ names and their expertise. Even though it takes some time for the employee to understand much of the technical aspects of the discussions, at least they are extending their knowledge regarding who people are in ACC and what their expertise are.

“In the very beginning it’s very difficult for new employees, because sometimes the discussions are very specific. If you don’t know anything about the topic it’s really hard to catch what is really the meaning behind it. After a while, if you can understand the questions and answers, then it may be a good tool, because you know if people are very active and you automatically get the names in your memory.”

Quality Management Moderator



The KX is extending existing members’ **networks** as well. If a member does not know someone who can solve or assist with their issue they can simply post it to KX. It is in the same time making it easier for someone who might be shy because they do not know the right person to contact in order to post on KX. As a result they are also extending their knowledge of **knowing who is where and knows what**.

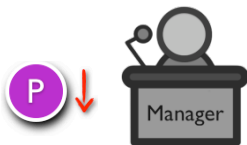
“If I ask people they always tell me if I know exactly that this person can give me the right answer I just call him or send an e-mail. If I am not quite sure who is the right one to ask then I put it in KX and hope that the one will reply. And it is always a question if you have the right contact and you have to contact people, I think people are very often shy contacting somebody who’s quite strange and they’ve never met before, directly by phone, mail is a bit easier. But in case you don’t know just put it in the KX because it’s a bit anonymous.”

Quality Management Moderator



5.4.5.1. Interventions in the Quality Management Community

As was mentioned in the discussion of the QM community, **institutionalization** was found to occur during meetings. It is important to emphasize that this is sufficient; there is no need for intervention by attempting to encourage the QM community to share the meeting information through the community. The communities are not there to replace the real-world interaction of employees. It is to assist them, allowing as it were, an additional platform to communicate. This insight can assist employees to better prepare for meetings. The emphasis of meetings should be on **institutionalization** related issues, whilst members should be encouraged to discuss **common practice** issues via the community, as opposed to during the meetings. This emphasis could assist in an increase in **relevance for organization** and **relevance to practice** respectively. This is relevant to other communities such as Supply Chain and Maintenance as well as where similar issues are seen to be in effect. This is especially the case with communities that struggle with sharing knowledge because of the tacit nature of the knowledge that requires sharing.



In setting up the communities, it was decided (presumably by management) which employees should be in which communities. Additionally, moderators were appointed to forward relevant emails to members of their community. This combination has, according to the QM Moderator, made members inactive and lazy; as the moderator's active forwarding has effectively allowed members not to be active on a day-to-day basis. Thus it has had a negative affect on **relevance to practice**.

"I can tell you there are a lot of people here at this site who never use it, never open it. The decision was made that people are dedicated to communities. And in case of the one I'm responsible for the quality community, it was decided, don't ask me by whom, that at each site there is more or less one responsible person to do the work, to have a look and then forward when necessary. So the work was put on the shoulders of some individuals. And a lot of people really rely on that so they do not open it, they don't look at it."

Quality Management Moderator



There is a common issue with many members in that they are frustrated with top management's inactivity in the communities. Top management are adamant that employees use the communities, but they are not active themselves according to many members.

"They (top management) all want that people use KX, but they never use it themselves."

Member 4



"I feel that KX is not in all cases supported by upper management. If you ask them they say: 'Yes it's a good tool!' People exchange, but if you look if upper management is looking in KX, no! So they don't use it themselves."

Quality Management Moderator



The first question that must be asked is: Why do members expect that management should be active in the communities? Top management is typically not working at a specific site, thus their knowledge of what is happening will not assist in solving common issues. Top management is much more involved in efforts that affect **institutionalization**, but it has been shown that **institutionalization** is addressed during meetings as opposed to in the communities (with the HSE as an exception).

Members do like to see that top management is active, as they are perceived to be experts with vast experience. And as we have noted, the communities that thrive are the ones with active experts.

"Our senior vice president who is now leaving (going into retirement) was one of the few people (of top management) where I could sometimes see the names on the list."

Quality Management Moderator

This issue could be applicable to communities such as the Supply Chain and Maintenance as well.

In short, the Quality Management Community enjoys a strong knowledge culture, with members interviewed appreciating the value it brings. Low levels of institutionalization are explained through the fact that traditional face-to-face meetings are more effective to address institutionalization issues. Training for new employees in the use of the KX is very valuable. By just reading, not necessarily being active, new employees learn who are the experts in their respective communities. Members are frustrated with management who do not walk the talk regarding knowledge sharing. These results are summarized in Table 10.



Table 10: Value related issues in Quality Management Community

Value related issues	
✓	Knowledge Culture
✓	Value of knowledge creation/transfer by itself
n/a	Communication of knowledge transfer
n/a	Time and Resources
n/a	Extrinsic Motivation and Incentives
n/a	Appraisal
✓	Training and Education
n/a	Personal market value of employees
?	Management

5.5. Chapter conclusion

This chapter introduced the case study. The embeddedness-measuring framework is implemented to measure the forms of embeddedness in ACC's knowledge sharing communities. Members from five communities were interviewed and the interviews were subsequently analyzed. Each community's knowledge sharing dynamics were elaborated on. This permitted the highlighting of network related issues that require management intervention.

It is important to emphasize that it is impossible for management to attend to all the issues in each community. Thus it is necessary to advise management on how to address these various issues. This has to be seen in the context of the knowledge network framework and the knowledge management landscape. This is discussed in the next chapter.



6. Contextualizing the case study results

This chapter contextualizes the results of the analysis of ACC's knowledge network. The concept of a knowledge management navigation system is presented to frame the results of the case study in the context of the pragmatic approach.

The conclusion of the chapter presents a schedule for the evaluation of a knowledge network that assists management in the process of implementing interventions.



It is essential to address how the analysis method and implementation of the embeddedness-measuring framework assist in answering the two research questions in Chapter 1.4.

The analysis of a real-world case study was crucial in testing the pragmatic approach, an approach that attempts to merge the emergent and engineering approaches.

6.1. Insights gained from analysis

The development of the embeddedness-measuring framework (Figure 16, page 44) assists in answering the first research question.

1. How do the dynamics of knowledge sharing work?

The forms of embeddedness enable us to make sense of the complexities of knowledge sharing. The forms illuminate the dynamics of social interaction (**connections**) that are at play between members, and how it affects knowledge sharing. Additionally organizational embeddedness and embeddedness in practice can assess the **content** shared between members.

Each community is analyzed and the dynamics of knowledge sharing and the interaction between forms of embeddedness are shown. This interaction is at times strengthening and at times weakening. Areas that show weakening effects are highlighted.

Furthermore, each community is analyzed to assess management's attempts at intervention. There are successful and unsuccessful attempts. With examples of management intervention, it is shown what form(s) of embeddedness are affected. Lastly, each community's interventions are mapped according to the network related issues (Table 4, page 32) that are discussed in Chapter 3.2.2.3. This assists us in addressing Research 2.

2. How do interventions by management affect knowledge sharing in a knowledge network?

We have addressed the effects of management intervention, and highlighted areas of intervention that require additional intervention. Referring back to Figure 11 (page 36), we thus answer the research question.

Yet, it is noted that it is not sufficient to simply list the network related issues of each community this would overwhelm management with too many issues that need to be addressed. Surely management cannot address all the issues at the same time. This allows us to update Figure 11 with Figure 23:

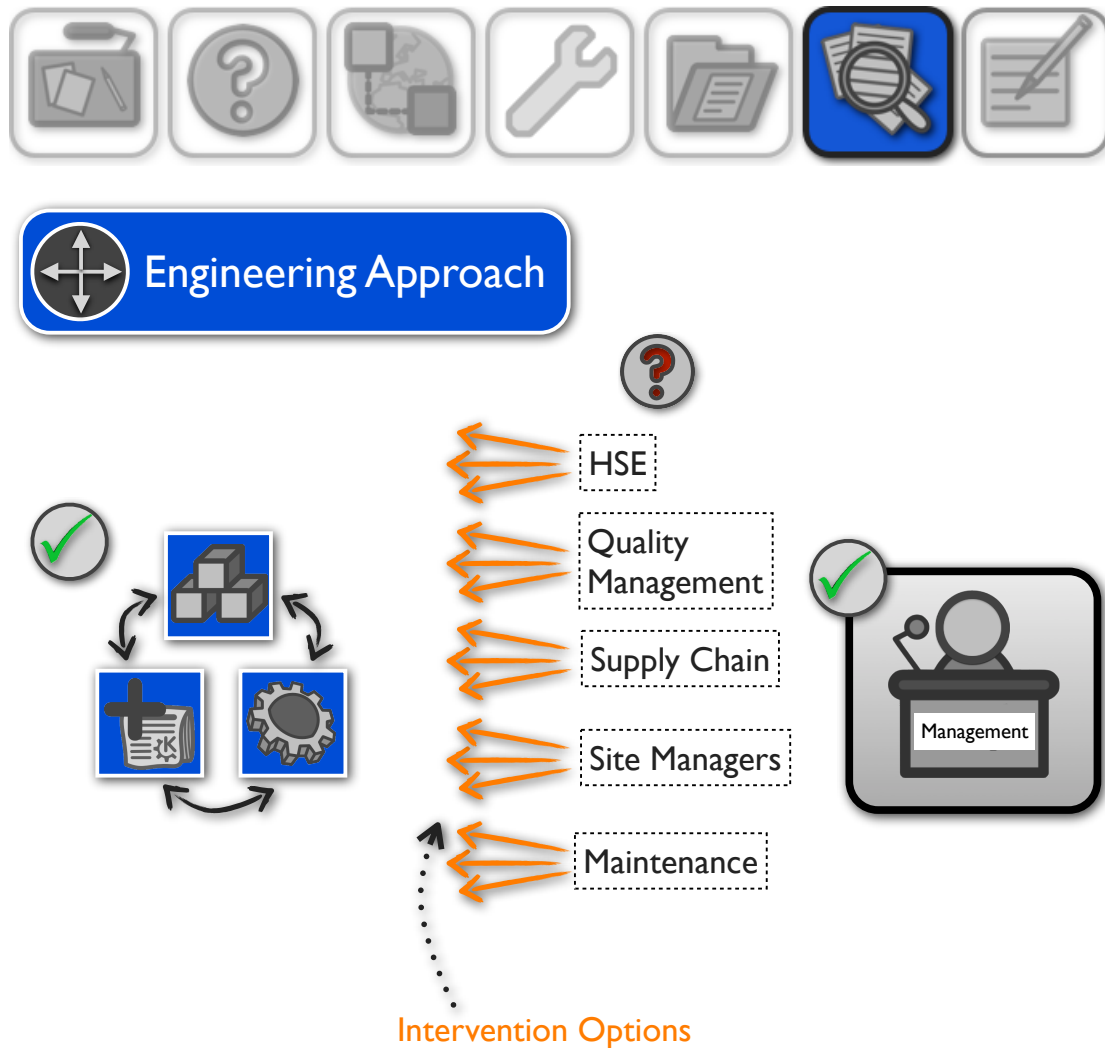





Figure 23: Current state of addressing Research Question 2

Throughout the analyses process it was shown how the dynamics of knowledge sharing are present in a knowledge network. The dynamic interaction affects every aspect regarding the knowledge network:

-  Organizational infrastructure
-  Technical infrastructure
-  Organizational culture

The reality of a real-world situation is that of a complex system of inter-related components, that need to function in unison to optimally support knowledge sharing. Affecting a singular intervention in one community could have many potential results. The embeddedness measurement framework cannot list the network related issues according to their relevance or highlight which issues are most important. Thus things have to be seen in context.

6.2. Management interventions in context

The question that arises is how does management decide which issues are most pertinent and which less so, or even negligible? To assess this question



we have to contextualize the issues at hand in each community with respect to the greater knowledge network.

We are able to contextualize this question through the knowledge network framework. It is important to acknowledge that the knowledge network framework is theoretical and not very dynamic; it is merely a conceptualization of a complex and dynamic real world system. Through implementing the embeddedness-measuring framework, the lack of dynamism is compensated and accurate results are achieved. Despite this a new dilemma emerges, whilst the measurements are very accurate, the intervention methods are comparatively crude.

The following quote that engineers commonly use sums up the reality of the dilemma that is encountered:

Measure with a micrometer.

Mark with chalk.

Cut with an axe.

Ray's rule of Precision

To put the results of the research into the context of the above quote, the embeddedness-measuring framework was developed to:

- Enable a very accurate assessment of the dynamics of knowledge sharing in a knowledge network.
- In turn, this enables the highlighting of issues in communities that need to be addressed by management.
- Although, when management requires advice on which interventions are most pertinent to implement, it is found that the methods of intervention are less precise, when compared with the measurement tool.

The measuring tool reveals many issues that require management's attention, but it cannot list these issues according to which require attention most or least.

In addressing this dilemma we refer back to the purpose of the knowledge network framework. The framework that is developed by Back et al. (2005) allows the holistic management of knowledge in a knowledge network. The ability to holistically manage is the crux of overcoming the dilemma of not being able to list the network related issues of each community according to importance. On the contrary, applying a holistic view allows one to recognize the interconnected nature of a knowledge network. The dynamics have been shown to exist between individuals that share knowledge in a community. Yet it is reasonable to believe that, as departments describe the organizational structure, so do the knowledge sharing communities describe the knowledge network's structure. If one applies this reasoning one step further, it means



that due to the interconnected nature of things, one intervention may affect various aspects of a community, if not other communities.

Does it mean that management's attempts to intervene are futile? No, they are not futile, but there is a shift in the focus of what is important for management. What it means is that, although we cannot advise management as to which interventions are more important, we can now accurately analyze what the effects are of an intervention. It is for management to assess which communities and issues are most important to be intervened in. Management's decisions will depend on external factors that influence the organizational strategy and goals, possibly even negating the value of a list of issues according to their importance.

Essentially it is more valuable to show management what the effects of their interventions are; irrespective of the supposed importance. In essence the embeddedness-measuring framework allows us to examine and analyze whether the intended effects of an intervention were obtained, and if not what aspects were affected.

Thus, the ability to evaluate interventions is proposed; this concept is developed in the context of the framework being a navigation system for management to steer the knowledge network.

6.3.A framework as a navigation system

The knowledge network framework describes the knowledge management landscape of an organization. Management must steer the knowledge network through this landscape by implementing interventions that will determine the best route to reach a destination where ideal knowledge sharing conditions exist. Consequently, to navigate this complex landscape a knowledge management "navigation system" is required. This 'GPS' must enable management to switch between a high-level strategic approach and a ground level view of what is happening with regard to knowledge sharing.

To illustrate the concept of a 'navigation system' the example of Google Earth is presented. Google Earth is a tool that gives the user access to a satellite view of earth. The user can navigate the satellite images by zooming in and out. It allows for seamless in and out zooming, whilst integrating various additional layers of data that can be activated.

A low level view of a town such as Stellenbosch, shows a lot of detail of its streets, buildings and layout, Google Earth allows one to activate layers that show the location of restaurants, places of interest, hospitals, parks, traffic, etc. Moreover, media (pictures, YouTube videos, Wikipedia entries etc.) that have GPS coordinates attached can be shown. This is of great benefit if one is zoomed in on a small town or a specific area such as Stellenbosch (Figure 24).

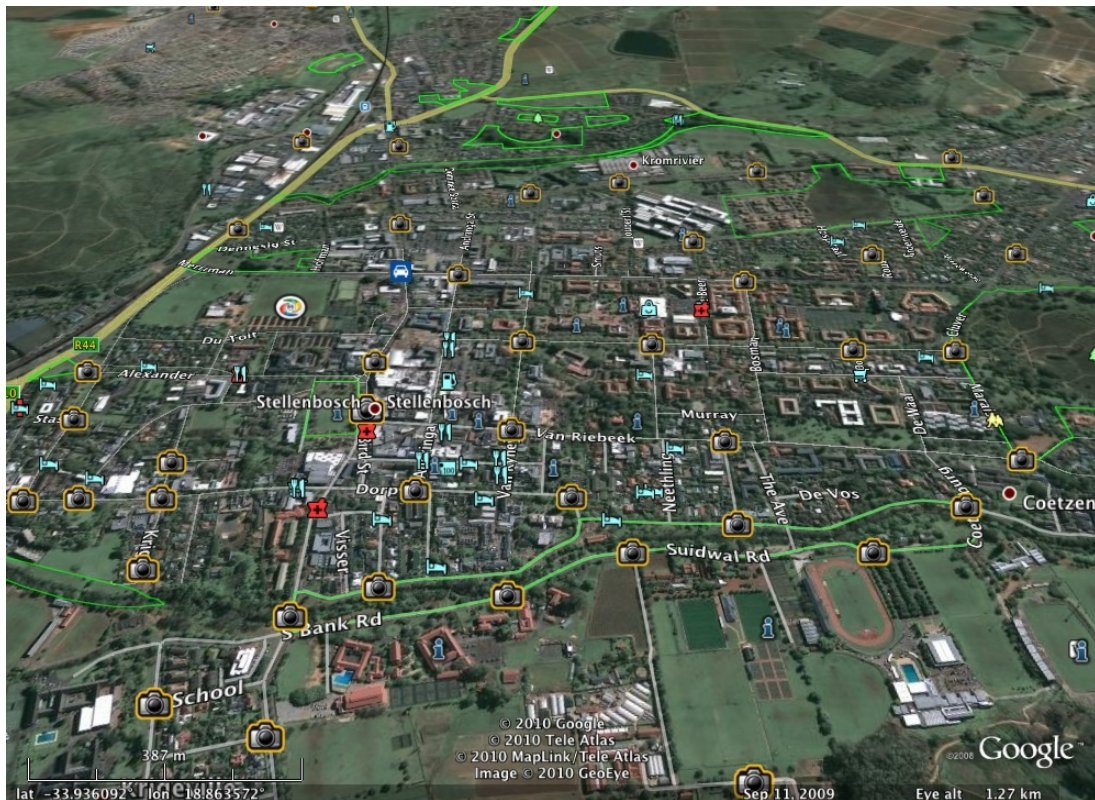


Figure 24: Google Earth view of Stellenbosch

As the user zooms out detail is lost, but this is necessary as one navigates toward a new location. If the user zooms out to a view that includes the Western Cape Peninsula (Figure 25), the user is now only concerned with the names of towns/suburbs around Stellenbosch and the major roads that link them, for this is the most important information required when navigating at this high level.

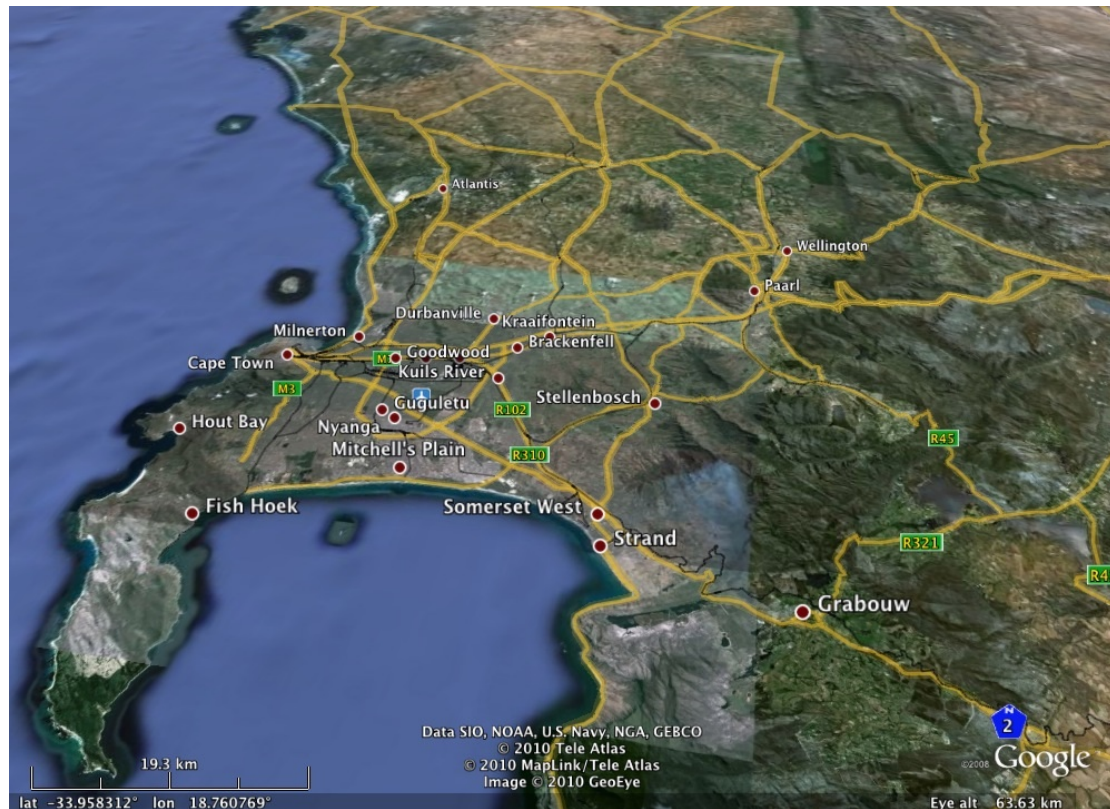


Figure 25: Google Earth view of Western Cape Peninsula

If this metaphor is applied to knowledge management in the context of the knowledge network framework, the ground level view is concerned with the emergent approach.

This view assists us in understanding the dynamics of knowledge sharing. The tool that is used to assess the dynamics that are at work is the embeddedness-measuring framework. The results of the framework highlight where attention is required in the knowledge network. It is merely a guide to management as to what aspects need to be addressed and cannot assess which issues are most pertinent. Refer to the bottom layer of Figure 26.

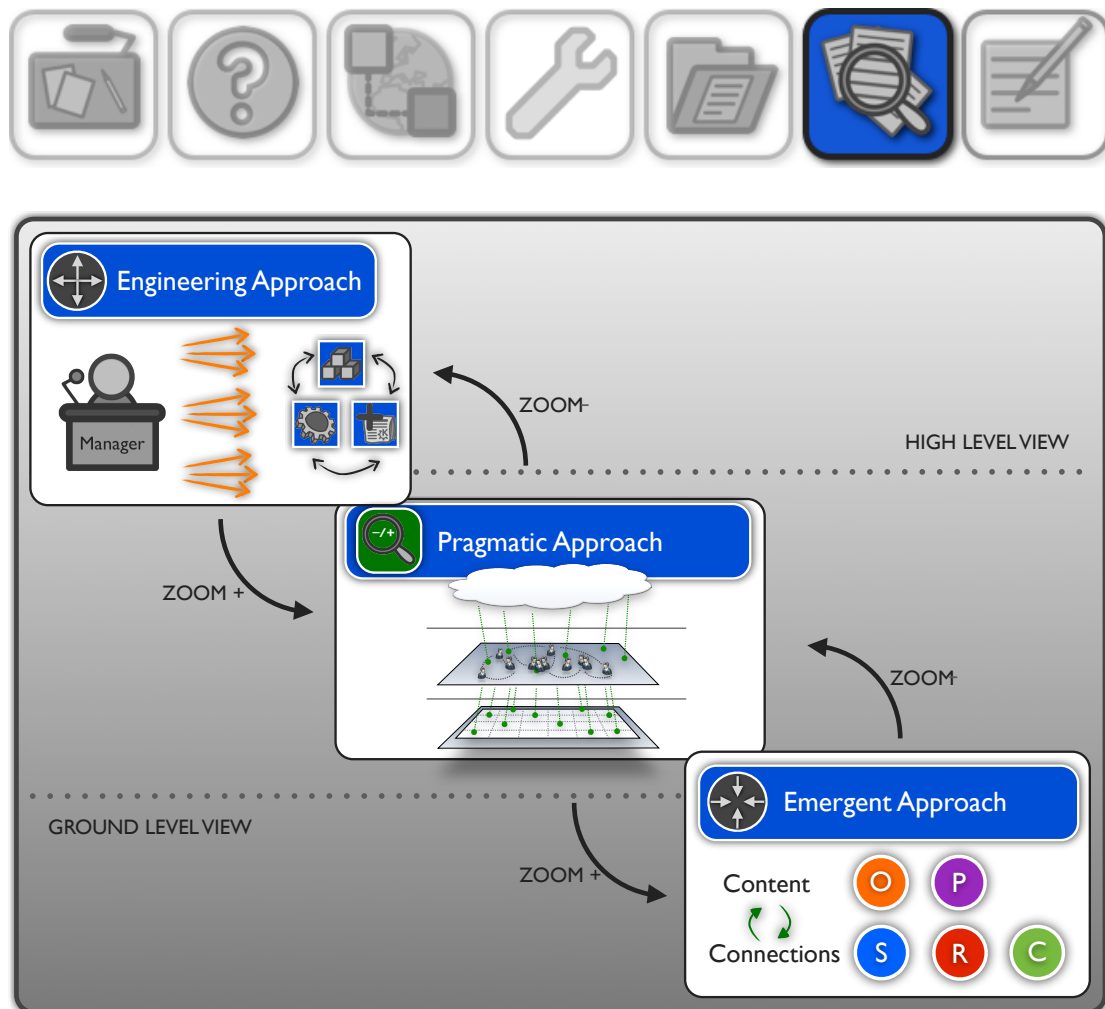


Figure 26: The pragmatic approach in action

When it comes to affecting interventions, management's decisions are influenced by the implementation of the engineering approach. The engineering approach in turn is put into practice from a high level view of operation. Thus, interventions are affected from a high level view, a view that attempts to take into account the entire knowledge management environment of the organization. Depicted in the top layer of Figure 26.

The ability to switch between the engineering approach (high level view) and emergent approach (ground level view) is the pragmatic approach (middle layer of Figure 26). The knowledge network framework can be placed in between these two views to enable the implementation of the pragmatic approach.

Inevitably the interventions that are affected by management will not be as precise as the measurements made during the assessment of embeddedness. However, because of the ability to now accurately measure the forms of embeddedness, it is conceivable that one will be able to measure the effects of the interventions accurately over a long period of time.



The final result of the research is the proposal of a schedule for the evaluation of a knowledge network (Figure 27). This is summed up in four steps:

- Step 1:** Measure the forms of embeddedness in the knowledge network
- Step 2:** Assess the network related issues that management can affect via interventions.
- Step 3:** Decide on which interventions are most pertinent and implement.
- Step 4:** Re-assess the effects of interventions by measuring again the forms of embeddedness, focusing specifically on those areas that the interventions were meant to affect.

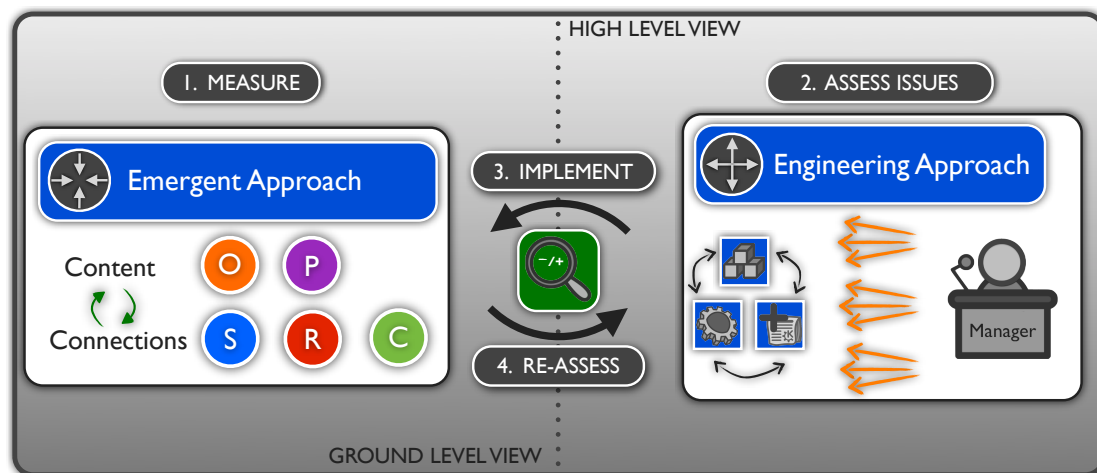


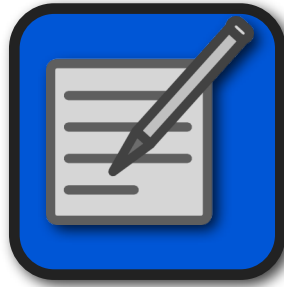
Figure 27: Schedule for the evaluation of a knowledge network

6.4. Chapter conclusion

This chapter addressed the dilemma encountered in the analysis of ACC's knowledge sharing communities. The areas of intervention that require management's attention are too many, and cannot be listed according to importance.

To overcome this dilemma a holistic view was applied by re-assessing the goal of the pragmatic approach. Consequently, it is recommended to view the knowledge network framework as the vehicle through which the pragmatic approach is implemented.

Finally, a schedule for the evaluation of a knowledge network was proposed to allow management to assess the effect of implementations.



7. Conclusion

This chapter summarizes the results of the thesis. The research methodology is concluded as each step of the methodology is shortly discussed. The results of the research is shortly discussed and put into context with regard to the pragmatic approach to knowledge management. Finally the limitations and suggestions for further research are presented.



7.1. Methodology summary

The value of knowledge sharing in an organization is undisputed. Employees interact on a daily basis during which tacit and explicit knowledge, in various forms, is exchanged. Knowledge networks enable employees, in a dispersed organization, to share their knowledge with one another. This in turn empowers organizations to gain organizational advantage and it assists in the fostering of innovation.

However, challenges exist regarding the role that management must play in knowledge management. In a scenario where management is interested in the effectiveness of an implemented knowledge network, two questions arise.

1. How do the dynamics of knowledge sharing work?
2. What interventions can management implement to improve knowledge sharing in the knowledge network?

To address these questions it is imperative that one understands what the knowledge management landscape encapsulates. The research methodology that was followed involved four steps, as depicted in Figure 28.

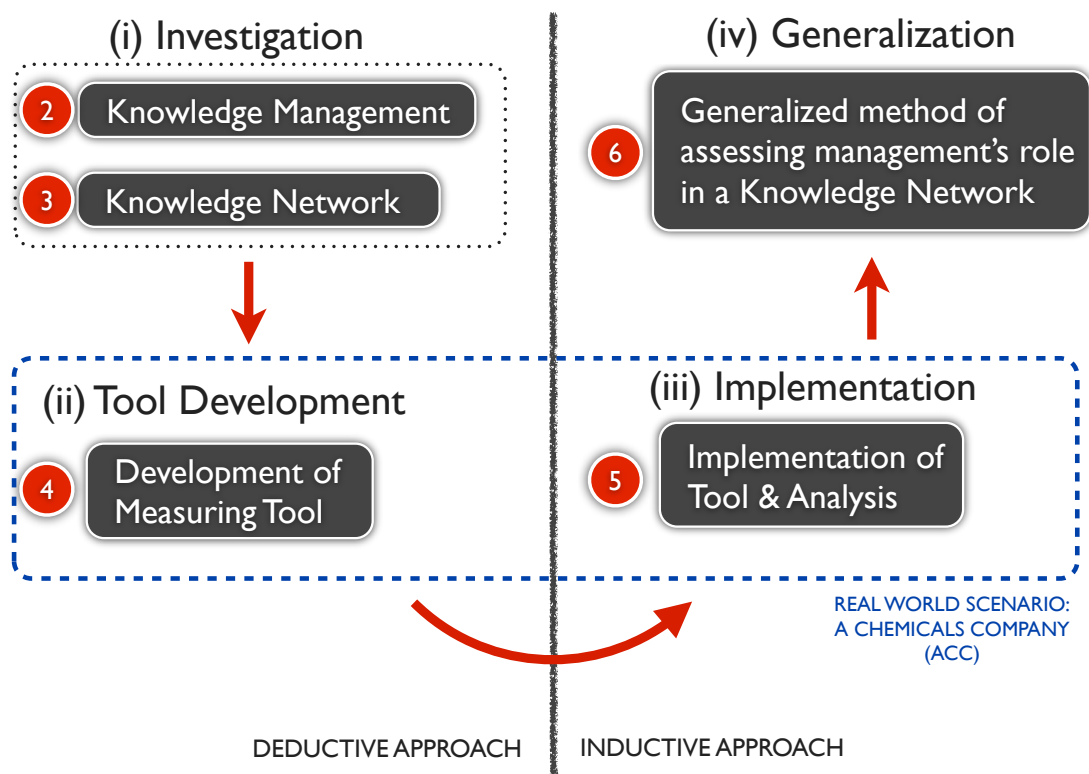


Figure 28: Research methodology

Figure 28 is divided in four sections each section is summarized next:



(i) Investigation

An investigation into the literature concerning knowledge management and knowledge networks was undertaken. In chapter 2, two opposing approaches to knowledge management, the engineering and emergent were discussed. Merging the two approaches is required as both are essential for the successful management of knowledge; this merging is referred to as the pragmatic approach.

The pragmatic approach has a two-tiered approach to managing knowledge. Firstly it acknowledges that knowledge sharing is an emergent process, influenced by the social dynamics between individuals. Social capital in the form of structural, relational and cognitive capital describes these social dynamics. The dimensions of social capital are mutually related and affect each other dynamically.

With regard to management's role, its role is to establish the conditions in which emergent variables exist. Management can facilitate, stimulate, and influence the emergence of social capital, which in turn influences knowledge sharing.

Secondly, the investigation assesses knowledge networks (Chapter 3) and focuses on the knowledge network framework. This framework describes the process of designing, implementing and maintaining a knowledge network. It takes into account the actors, relationships, resources and organizational properties that a knowledge network consists of. The framework plays a central role in developing the embeddedness-measuring framework tool that allows for the analysis of the dynamics of knowledge sharing.

(ii) Tool Development

This tool is developed in Chapter 4, and built around the concept of embeddedness. Five forms of embeddedness are discussed. It enables the evaluation of the connections between members and the content they share with one another. Content is measured by:

- Organizational embeddedness
- Embeddedness in practice

Whilst the connections between members are measured by:

- Relational embeddedness
- Structural embeddedness
- Cognitive embeddedness

(iii) Implementation

Chapter 5 sees the forms of the embeddedness-measuring framework being used to analyze five communities in ACC's knowledge network. The results of the analysis illustrate how the dynamics of knowledge sharing occurs in the communities, thus answering the first research question.



With regard to the second research question, the analysis process illuminated which network relates issues are well supported and need to be addressed by management. However the issues that require intervention cannot be listed according to their need for intervention, additionally, it is not feasible for management to implement all of the proposed interventions in each community.

(iv) Generalization

Chapter 6 addressed this problem, as part of the generalization phase of the research methodology. The metaphor of a navigation system is used to illustrate the implementation of the pragmatic approach.

7.2.A pragmatic answer

In the case of a real world system, it is acknowledged that the ability to measure the dynamics of knowledge sharing is much more precise than the intervention options that can be implemented by management.

It is necessary to frame this problem in the context of the knowledge network framework that describes the knowledge management environment and the pragmatic approach that enables the navigation between high level strategy (engineering approach) and a ground level view (emergent approach).

Thus, in answering the second research question, a schedule for the evaluation of a knowledge network is proposed. The reasoning entails that the following process should be implemented:

1. Measuring the dynamics of knowledge sharing via forms of embeddedness.
2. Assessing which aspects of the knowledge network require interventions by management.
3. Assisting management to decide on which specific interventions to implement according to the engineering approach strategy
4. Re-analyzing the forms of embeddedness that were affected by the interventions.

This schedule allows a comparative analysis of the before and after effects of each intervention. Enabling management to assess the effects of interventions over a period of time. This will allow the creation of a history of interventions, from which management can learn.



7.3. Limitations and further research

There are some limitations to the research. Similar to Agterberg et al. (2010), generalization issues do exist. A form of analytic generalization (Yin, 1989) was followed, this means that there are possibly other conditions that may affect knowledge sharing that were not accounted for, or may not have emerged in the research, such as, estimations of costs and needs of knowledge asymmetries (Agterberg et al., 2010).

A longitudinal study of a knowledge network would shed light on whether the dynamics of knowledge sharing changes over time. The longitudinal study would enable the implementation of the schedule for the evaluation of a knowledge network. Thus enabling the refining of the embeddedness-measuring framework. It will also allow a comparison of management interventions, enabling management to assess whether interventions have had the desired effects, or reassessing and refining intervention techniques.

Additional case studies should be considered to implement the embeddedness-measuring framework. Case studies in other industries will highlight the feasibility of the framework and if alterations are required. This will increase the generalizability of the research.

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Appendix A - Table of Interviewees

Alias	Position	Location	Community(s)
Maintenance Moderator	Moderator Maintenance	Wesseling	Maintenance
Quality Management Moderator	Moderator Quality Management/ Corporate Quality Manager Europe	Wesseling	Quality Management
HSE Moderator	Moderator HSE/ Quality Management representative	Wesseling/ Knapsack	HSE, Quality Management
Member 1	Process Engineer	Pernis/ Moerdijk	HSE, Extrusion.
Member 2	Shipping officer	Antwerp	Supply Chain
Member 3	Quality and Logistics manager	Pernis	Additives, Productions, Logistics, Quality Management
Member 4	Quality Administrator	Moerdijk	Supply chain, Quality Management
Member 5	Mechanical Engineer	Moerdijk	Maintenance, Extruder, SAP
Member 6	Assistant Plant Manager	Pernis	HSE, Polymerization, Extrusion
Member 7	Plan Scheduler	Moerdijk	Supply chain
Member 8	Assistant Quality Manager	Pernis	Logistics, Supply chain
Member 9	Plant Scheduler PBI	Pernis/ Moerdijk	Not active member
Member 10	Quality Engineer	Moerdijk	QM
Member 11	Working in several Asset Management & 6 Sigma Projects	Wesseling	Supply chain, Additives, Extrusions, 6 Sigma, HSE, QM
Site Manager 1	Site Manager	Australia	Site Managers; HSE
Site Manager 2	Site Manager	Tarragona, Spain	Site Managers; HSE
Site Manager 3	Site Manager	Lake Charles, US	Site Managers; HSE
Site Manager 4	Site Manager	UK	Site Managers, HSE, Maintenance
Site Manager 5	Site Manager	Argentina	Site Managers, Extrusion Reliability
Vice Pres. of Man. in US	Site manager/ Vice President of Manufacturing in US	US	Site Managers

Appendix B – ATLAS.ti

Compiled from <http://www.atlasti.com/>

ATLAS.ti is a qualitative analysis software package. It offers a variety of tools for accomplishing all the tasks associated with a systematic approach to unstructured data, i.e. data that cannot be meaningfully analysed by formal, statistical approaches. It helps one to explore the complex phenomena hidden in textual data.

ATLAS.ti assists the user to better manage the analysis of interview data. The Document Manager enables the structuring of the interviews. The software is designed to assist the analyst in the analysis process in the following ways. Through an exploratory, yet systematic approach to the data (as opposed to a mere "bureaucratic" handling), it is assumed that especially constructive activities like theory building will be of great benefit. The entire program's concept, including the process of getting acquainted with its particular idiosyncrasies, is particularly conducive to an exploratory, discovery-oriented approach.

Within ATLAS.ti, initial ideas often find expression through their assignment to a code or memo, to which similar ideas or text selections also become assigned. ATLAS.ti provides the researcher with a highly effective means for quickly retrieving all data selections and notes relevant to one idea.

The following tools assist the analyst:

- **Quotation Manager:** Lets you manage all coded data segments. You can name or rename each quotation ID, sort, filter or delete quotations, write comments or review commented segments.
- **Code Management:** Gives you a full overview of all codes at any time and lets you manage (sort, rename, merge, delete) your codes conveniently.
- **Memo Manager:** Gives you a full overview of all memos at any time and lets you manage (sort, rename, delete, apply) or review your memos.